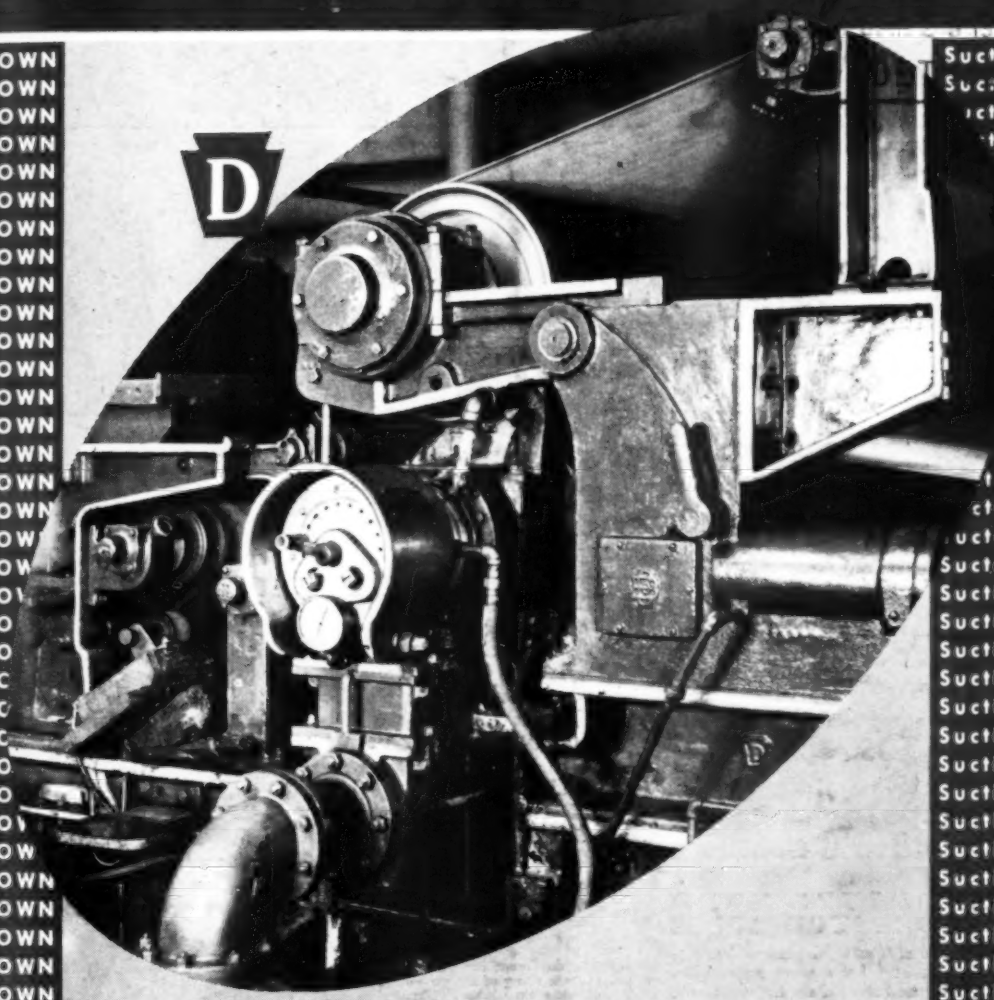
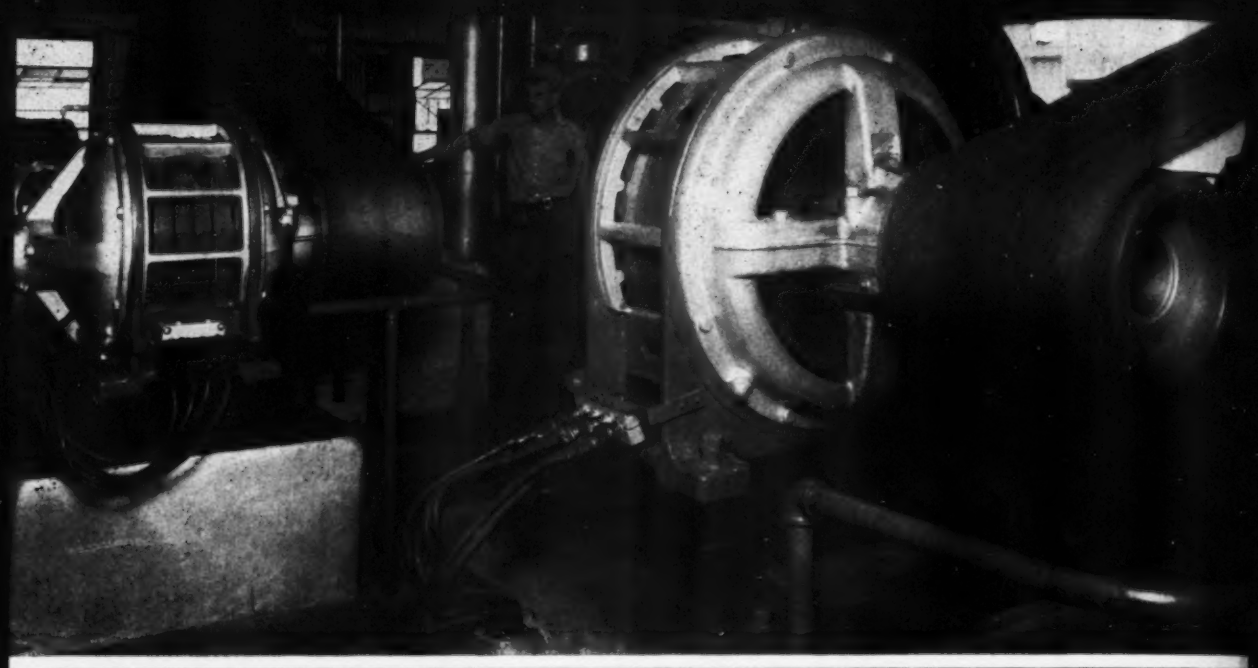
THE PAPER INDUSTRY and PAPER WORLD

AN EDUCATIONAL NEWS MAGAZINE—JANUARY, 1945

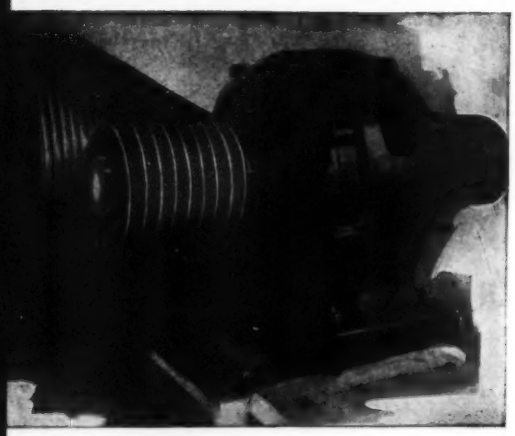


Suction presses save coal for dryer steam. This will be just as important after the war as it is today, for then competition and price will rule. Before you choose, remember what a manufacturer puts into a roll construction regulates what performance you get out of a roll. No machine is too big or so arranged that our rolls cannot be installed. Catalog on request.

DOWNINGTOWN MFG. CO., DOWNINGTOWN, PA.



ROCKWOOD *automatic belt tightening* MOTOR BASES



V-BELT DRIVES NEED ROCKWOOD MOTOR BASES

because V-belt drives slip at load peaks—increasingly so as grooves and belts wear in service. There is an amazing and immediate improvement when the motor is mounted on a Rockwood base and the belts kept tight to prevent belt slip.

If there is any data you desire—or any questions you want to ask—we will be glad to hear from you. The Rockwood dealer near you carries a stock of Rockwood bases—along with his stocks of Rockwood V-belts, V-sheaves and Rockwood paper pulleys.

Rockwood are the world's largest manufacturers of pulleys—with 1,447 stock sizes ready to ship. Their stocks of V-belts and V-belt sheaves are enormous—even today. With 7,889 stock sizes of V-sheaves—and every size and length of V-belts. A large percentage of which is ready for immediate delivery.

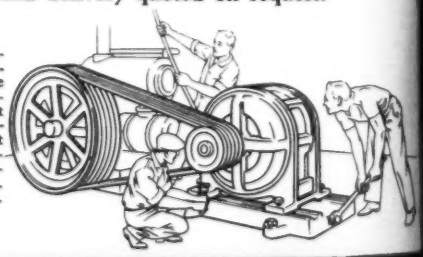
Compressor motors mounted on Rockwood Bases produce more air and at lower overall costs

With flat belts or V-belts the Rockwood automatic belt tightening motor base assures maximum compressor performance—WITHOUT INTERRUPTIONS—WITHOUT BELT TROUBLE. By keeping the belt tightness adjusted automatically to match the load COMPRESSOR CAPACITIES ARE INCREASED.

No longer will the belts slip and the compressor slow down at peak loads. Gone are the worries about belt wear and breakage. With Rockwood motor base the belts will have nearly double their former life. Drive maintenance will be eliminated. The Rockwood motor base becomes your maintenance man.

YOU DO NOT HAVE TO WAIT UNTIL YOU BUY A NEW COMPRESSOR TO INSTALL A ROCKWOOD DRIVE. You can install one under ANY compressor belt drive motor you now have—use the same belts—Rockwood bases are available—up to 60 h.p. from stock—up to 250 h.p. (semi stock) delivered with reasonable promptness—still larger sizes prices and delivery quoted on request.

Costly shut downs for manual belt tightening are a thing of the past—too wasteful of time and labor. Thanks to the Rockwood pivoted motor base belt tightening is now made automatic. Belts that stretch are automatically re-tightened—and neither too tight nor too loose—but just right to suit the varying load. Considered the biggest improvement ever developed for electric motor belt drives. For use with either V-belts or flat belts.



ROCKWOOD

INDIANAPOLIS • U.S.A.

Specialists in Power Transmission Equipment Since 1884

PORTRAIT OF A THOROUGHBRED

Beloit customers will see promise of a bigger and brighter Tomorrow in this picture of a Beloit Straw Machine, pre-war model, in operation at Alton Boxboard Co., Alton, Illinois. During wartime, Beloit has turned out a steady flow of vast, precision-built machines for Victory. In peacetime, that same engineering skill will augment your paper-making career with mechanical developments, new keys to production and profit.

Buy War Bonds for Victory!

BELOIT IRON WORKS • PAPER MACHINERY • BELOIT, WIS., U.S.A. • SERVING UNCLE SAM 1ST FOR THE DURATION •

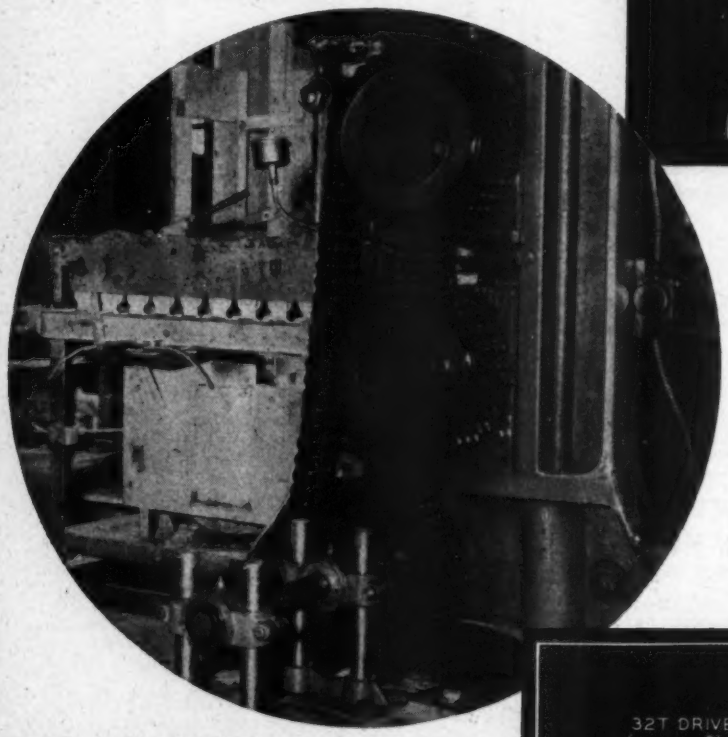
BELOIT

BELOIT IRON WORKS, BELOIT, WIS.

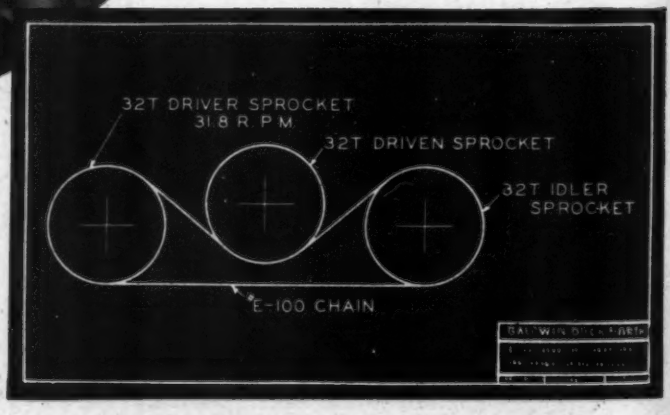
WHEN YOU BUY BELOIT . . . YOU BUY MORE THAN A MACHINE!

Do you want POSITIVE Power Transmission?

① DO YOU NEED a drive that transmits positive power . . . a drive that doesn't slip or fail in emergencies? Here it is—Baldwin-Rex Roller chain belts.



② THIS CALENDAR DRIVE for example, has the extra strength and stamina that a positive drive needs. The triple strand of Baldwin-Rex doing the driving keeps the power flowing. There's no slipping here to waste power and time . . . no jerky, uneven power transmission. Turning those heavy rolls is child's play for husky Baldwin-Rex. It really stands up in tough service.



③ IT'S A HUSKY DRIVE as this drive arrangement shows. Whenever power is to be transmitted economically and efficiently without waste, Baldwin-Rex Roller chain belts can do the job. They have high shock-absorbing ability and are not adversely affected by dust or grease. Their ease of installation and effective operation regardless of center distances make them ideal for all types of power transmission work.

For catalogs on Baldwin-Rex Roller chain belts or competent information on your specific drive problems, write **BALDWIN-DUCKWORTH** *Division of* **CHAIN BELT COMPANY,** 371 *Plainfield Street, Springfield 2, Mass., or call your local Baldwin-Rex representative.*

BALDWIN-REX ROLLER CHAIN BELTS

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PHILCO
STORAGE BATTERIES

ARE BUILT [illegible] TO MEET
BY THE [illegible]
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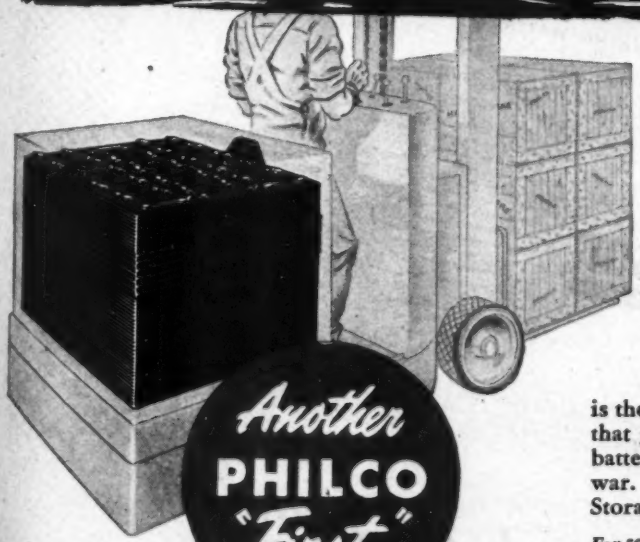

Another PHILCO "First"

The procession of Philco "Firsts", covering the whole field of motive power and stationary batteries, has set the pace in modern battery design. Check back over the developments which have contributed *most* to today's higher capacities, increased efficiency, longer life and over-all lower cost of storage battery power. The record shows *you get it first with Philco.*

THE NEW PHILCO "THIRTY"

Newest of the long series of major storage battery developments pioneered by Philco, is the new Philco "Thirty", the revolutionary battery that gives 30% longer life. Here is the motive power battery for industry's toughest jobs, now and after the war. Write for information. Philco Corporation, Storage Battery Division, Trenton 7, New Jersey.

For 50 Years a Leader in Industrial Storage Battery Development

NATURE'S PERFECT DRINKING WATER . . . RIGHT IN YOUR HOME
SOON MILLIONS of people will enjoy a brand-new sensation in their every-day tap water. From their faucets will flow drinking water . . . cooking water—free from objectionable tastes and odors . . . as taste-satisfying as water from nature's finest spring. A startling improvement—made possible for the first time by the new Chlorine Dioxide water-treatment technique developed by Mathieson.
For many years America has enjoyed the *safest* water in the world, thanks to the combined efforts of health authorities, water works officials and manufacturers of treating chemicals and equipment. Yet certain objectionable tastes and odors have persistently defied elimination by all known purification methods. But now Mathieson's new, exclusive technique—requiring no expensive equipment—produces amazing results with Chlorine Dioxide formed by the chemical reaction of chlorine and Mathieson Sodium Chlorite.
Mathieson, leading producer of chemicals for water purification for nearly 50 years, invites water officials troubled with taste and odor problems to investigate the new Chlorine Dioxide technique for possible post-war use.
Mathieson CHEMICALS
THE MATHIESON ALKALI WORKS (INC.) 60 EAST 42nd STREET, NEW YORK 17, N. Y.

To Our Friends in Industry

REPRODUCED above is the black and white version of the Mathieson advertisement in the January 1945 issue of FORTUNE magazine. It tells of a notable achievement by Mathieson's technical staff—the development of an amazing new technique for removing objectionable tastes and odors from public water supplies by the use of Chlorine Dioxide produced from Mathieson's Sodium Chlorite.

The remarkable fact that this new reagent—Chlorine Dioxide—*has 2½ times the oxidizing power of chlorine,* plus the simplicity with which it may be generated in your own plant, may suggest its application in your business. That its usefulness will be widespread—will embrace many industries—has already been proven.

Mathieson's technical staff—the same group responsible for Chlorine Dioxide and other important new developments—will welcome the opportunity to assist in adapting Chlorine Dioxide to your use.

THE MATHIESON ALKALI WORKS (INC.) 60 EAST 42nd STREET, NEW YORK 17, N. Y.

THE PAPER INDUSTRY
and PAPER WORLD

(Reg. U. S. Pat. Off.)

- Serving the Industry Since 1919 -

VOLUME 26 — JANUARY, 1945 — NUMBER 10

Published monthly by

FRITZ PUBLICATIONS, INC.

59 E. Van Buren St., Chicago 5, Ill.

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THE PAPER INDUSTRY and PAPER WORLD is indexed regularly in *The Industrial Arts Index*. An index to each volume is issued annually by the publisher as Section Two of the April number.

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Entered as second class matter June 29, 1938, at the post office at Chicago, Ill., under the Act of March 3, 1879. Subscriptions in the United States, U. S. Possessions, Canada, Cuba and Mexico, $2.00 for one year, $3.00 for two years. All other countries $3.00 for one year, $5.00 for two years.

The Last Word, IN AUTOMATIC CONTROL FOR SULPHITE DIGESTERS!

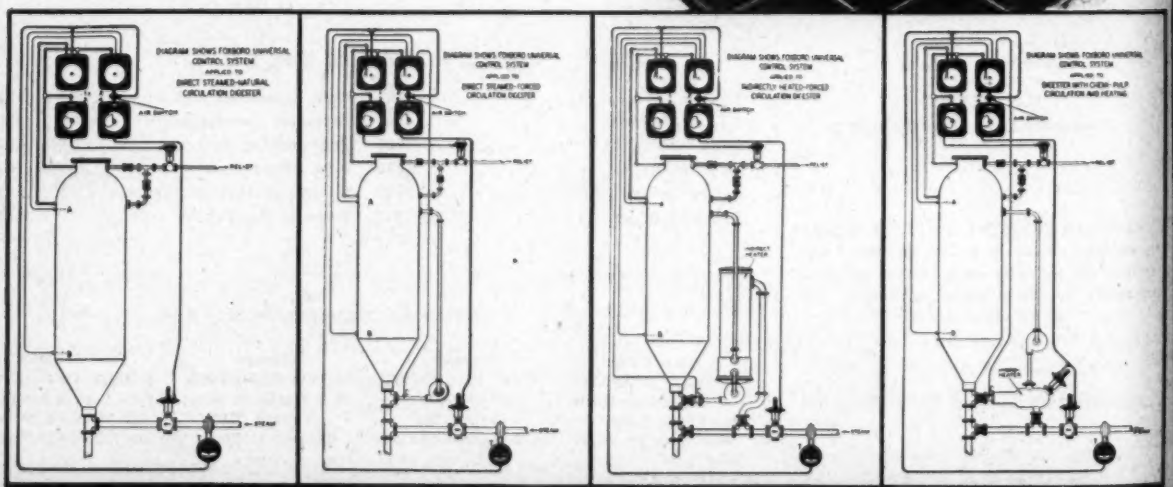
New compact Universal Control System offers new high quality and economy in pulp cooking

From more than 20 years of down-to-earth experience in pulp-cooking instrumentation, Foxboro now has developed a complete "packaged" control system that sets a new high in combined performance, convenience and versatility.

Unaided, the new Foxboro Universal Control System regulates digester heat input and gas relief so that cooking pressure and temperature follow exactly prescribed schedules from start to finish. Further, this efficient modern unit is equally suitable for any type of sulphite digester – natural or forced circulation, direct-steamed or externally-heated. (See diagrams below.)

Write for detailed information on this important advance in sulphite digester control. Also data on similar "packaged" control systems for alkaline digesters. **The Foxboro Company, 158 Neponset Ave., Foxboro Massachusetts, U. S. A.**

Foxboro Automatic Digester Control Unit. Supplied complete with following instruments ready-mounted in a modern protective steel cabinet: 1. Foxboro Steam Flow and Liquid Level Recorder with Steam Flow Integrator (top left); 2. Foxboro Dynalog (electronic) Three-Point Temperature and Top Pressure Recorder (top right); 3. Foxboro Cam Schedule Pressure Controller (lower left); 4. Foxboro Cam Schedule Steaming Controller (lower right).



FOXBORO
REG. U. S. PAT. OFF.

AUTOMATIC DIGESTER CONTROL

ARE YOU IN A HURRY?

if so, here's help!

A production man has just compiled a book which shows how to get many a job done in a hurry without time-killing toil or elaborate equipment.

24 pages packed with facts and photographs

SHOW HOW

There you have it, the answer is COMPRESSED AIR. Every plant foreman should have a copy of this booklet — it is a clearing house of ideas for production men.

Write or phone the company or any of its branches today for your copy; it is yours for the asking.

Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y.

Please Send Us a Copy of Bulletin
"A LITTLE AIR POWER WILL DO MANY A BIG JOB"

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ONE OF 27 DOW CHEMICALS USED BY THE PAPER INDUSTRY

Answering

a sticky problem

in Adhesives

Solved by Methocel—a sticky problem in the leather industry! And the solution indicates the versatility of Methocel—its ability to aid industry in many ways and in many fields.

Tanneries have long sought some means of drying leather without any shrinkage, distortion or rupturing. Ordinary adhesives failed on this ticklish job.

Methocel did the trick. Now tanneries use it as an adhesive to fasten leathers to drying frames. It holds the leather flexibly, prevents damage, and permits easy removal. Tanners get more and softer leather.

Of course, Methocel is more than an adhesive. It is a water-soluble cellulose ether of exceptional purity and uniformity, with wide uses for dispersing, thickening, emulsifying, sizing, and coating. Perhaps it holds the key to one of your production problems. Write today for complete information.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago
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Methocel

Water Soluble Dow Methylcellulose

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

HAVE YOU EVER STOPPED . . . .

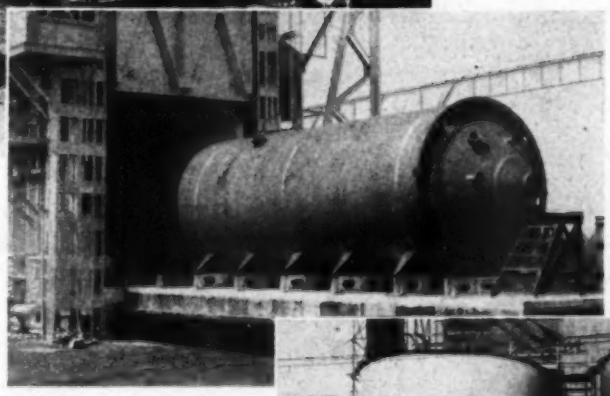
. . . to consider the advantages of increasing the capacity of your pulp mill?

A COMPLETE modernization and expansion program, aimed at increasing capacity of your mill, could place you in a more favorable position to meet production requirements, *come what may!* Flat-bottom storage tanks for water or chemicals, elevated water tanks, diffusers, reservoirs, sulphate digesters, barking drums, steel smoke stacks, bins and stand pipes — designed and fabricated in our plants — have already been installed at many pulp mills to expand their manufacturing capacity.

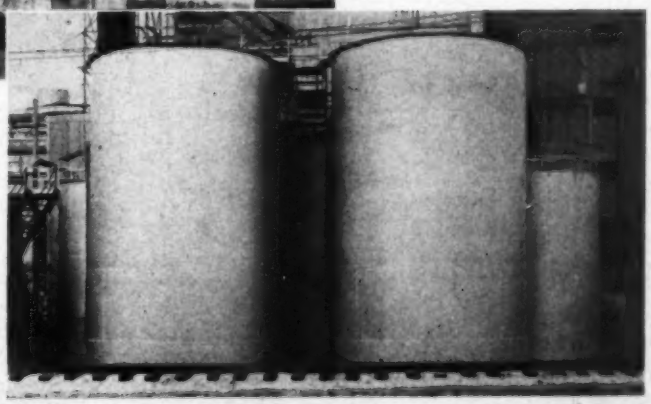
We have facilities at our Birmingham plant for stress-relieving and x-raying digesters and other pressure vessels in accordance with ASME specifications.

Above: A 100,000-gal. Horton elevated tank located at a southern sulphite mill. It is used for general water service.

Right: A 9-ft. 9-in. diam. by 42-ft. sulphate pulp digester leaving the stress-relieving furnace at our Birmingham plant.



Below: This group of softening plant tanks at the West Virginia Pulp and Paper Company's Charleston, S. C., plant, includes two 20-ft. diam. by 35-ft. tanks; two 12-ft. diam. by 29-ft. tanks; and two 12-ft. diam. by 24½-ft structures.



Now is the time to increase your mill capacity!

We will be glad to submit quotations, without obligation to you, on the types of tanks and steel plate work listed above.

CHICAGO BRIDGE & IRON COMPANY

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Houston, 1.....5643 Clinton Drive
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San Francisco, 5.....1017 Rialto Building

Plants at BIRMINGHAM, CHICAGO and GREENVILLE, PENNA.

In Canada: HORTON STEEL WORKS, Limited, FORT ERIE, ONT.

Greatest V-Belt Show ON EARTH!

EVERY MEMBER OF ALLIS-CHALMERS GREAT NEW V-BELT TEAM IS SPECIALLY DESIGNED, TESTED AND BUILT TO LICK A SPECIFIC DRIVE PROBLEM, SAVE YOU MONEY AND TROUBLE

DON'T WORRY IF YOUR BELTS MUST PRACTICALLY BATHE IN OIL OR GREASE. JUST ASK FOR SUPER-7 OIL-PROOF. I'M MADE OF IMPERVIOUS NEOPRENE.
OIL

IT PAYS TO MAKE ALLIS-CHALMERS YOUR

V-BELT DRIVE HEADQUARTERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

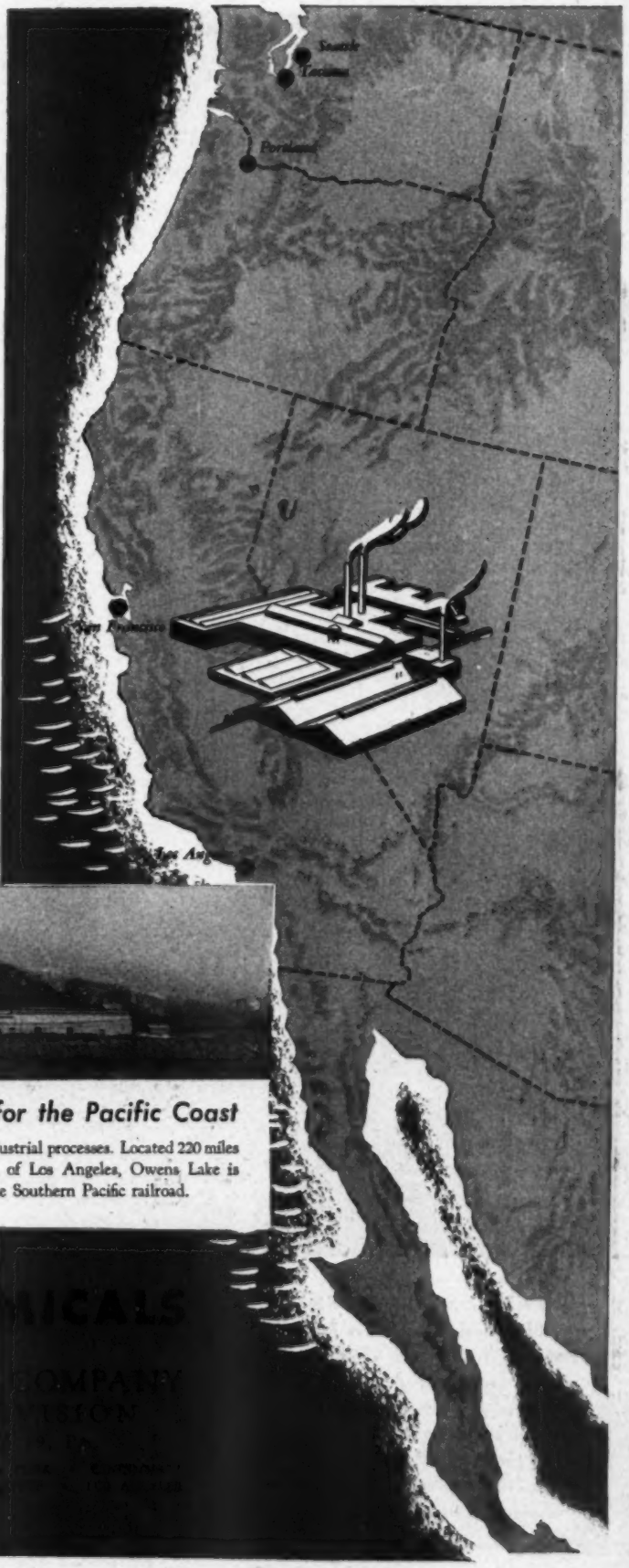
COLUMBIA makes another contribution to national industrial progress . . .

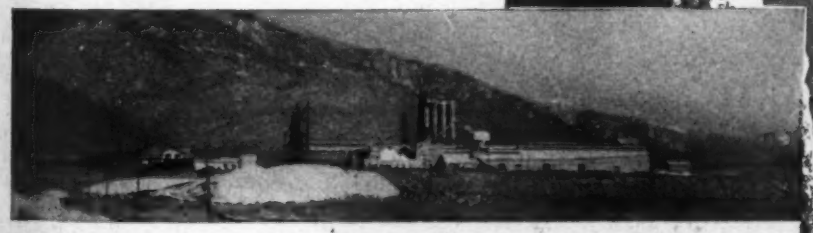
Pacific Coast Production

The entire nation looks ahead to the continued expansion of Pacific Coast industry, so necessary to America's future. Columbia is proud to join with the hundreds of industries which will help to add this important chapter to American industrial history.

As announced recently, the Pacific Alkali Company has become a Columbia division. Pacific's rich alkali deposits provide the source of an abundance of essential industrial chemicals. And the production and distribution facilities of Columbia combine to guarantee that these needs of industry, up and down the Pacific Coast, will be efficiently and economically served.

This expansion of Columbia facilities is another example of its progressive policy which seeks not only to serve the immediate needs of its customers throughout the nation, but to anticipate them to as great an extent as possible.





OWENS LAKE, *Rich Source of Alkalies for the Pacific Coast*

Owens Lake is a natural deposit of alkalies consisting principally of Soda Ash, Borax and Sesqui-Carbonates . . . chemicals essential in numerous industrial processes. Located 220 miles to the north of Los Angeles, Owens Lake is served by the Southern Pacific railroad.

COLUMBIA CHEMICALS

PITTSBURGH PLATE GLASS COMPANY
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The illustration and editorial on this page, also the tree farm data on the opposite page, are reproduced through the courtesy of the American Forest Products Industries, Inc.

GROWING MORE TREES is now recognized as one of America's greatest jobs—one that will insure it against future lack of forest products.

Tree farms are a part of a national movement sponsored by forest industries in a widespread program of perpetuating forest resources. The designation is given by voluntary organizations of timberland owners to properties which have been inspected and approved by forest authorities.

Requirements include high standards of fire protection and the practice of one of the forms of continuous yield technique, or "cropping" of forest products. Many thousands of acres of forest lands, aside from certified tree farms, also are being managed for continual crops of trees, but have not yet been inspected for certification.

Wood is of vast industrial importance—the most versatile servant of physics and chemistry.

TRADE WINDS

Helping Each Other Is Patriotic

▸▸▸ THE COURAGE AND PATRIOTISM of a family in the little town of Canaan, Vermont, has won national recognition.

The Periodical Publishers National Committee (whose chairman is Walter D. Fuller, president of Curtis Publishing Company) has been working closely with the War Production Board's campaign for more farm production of forest products.

In the town of Canaan, Vermont, the John Jewell family, consisting of his wife and four boys, owned a farm and woodland near the town of Lemington, Vermont. Last fall, Mr. Jewell was injured seriously when a tractor overturned and crushed his leg. This was a heavy blow to the little family, but courageously Mrs. Jewell and the boys carried on. One of the toughest problems to be met was the cutting of wood which Mrs. Jewell recognized as being of the utmost importance to the war effort. She and the three oldest sons took over the full wood-cutting operations and produced 200 cords of pulpwood.

The story of this fortitude and fine spirit came to the attention of the Publishers National Committee with the result that the Committee decided this courageous American family should have some of its burdens lightened. The result was that the Jewell family received a gift — a Disston Chain Saw powered by Mercury Engine. This saw makes the work of cutting logs like child's play. The saw has teeth on a revolving chain and is operated by a small gasoline motor.

Mrs. Jewell and son, Robert, trying out the new Disston Chain Saw.

The formal presentation of this fine equipment to the Jewell family was held before a gathering of their friends and citizens of the community. Chairman Fuller himself gave an address and made the presentation.

THE TREE FARM MOVEMENT by forest industries has been in operation only three years. Since its inception, nearly ten million acres of American forest lands are now officially certified as tree farms, according to the forestry department of the National Lumber Manufacturers' Association.

Starting in the West, the tree farm movement has now spread to ten states, evenly divided between the West and the South. Acreage in the South totals 5,783,461.27 on 656 tree farms; and in the West, 3,516,837 on 49 farms.

The number of tree farms in each state is reported as:

Alabama	296	Washington	16
Arkansas	257	Oregon	21
Mississippi	28	California	4
North Carolina	10	Idaho	5
Texas	65	Montana	3

Growing Shortages Confront Paper and Paperboard Industries

▸▸▸ THE CONTINUED DRIVE for pulpwood was announced on this page last month. Emergency committees representing the paper and paperboard industries have now issued a special announcement that both the U. S. Victory Pulpwood Campaign and the U. S. Victory Wastepaper Campaign will be continued into 1945.

At an emergency wastepaper conference held in Washington in December, major mill operators and government officials attending were told that some mills faced shutdowns unless collections improve. The factors responsible for this serious situation were given as:

1) Sharp increases of estimates on military supplies for 1945

2) Greater demands for manpower in war production plants which has worked to the disadvantage of the wastepaper dealers' operations

3) Serious shrinkages in pulpwood stocks

4) Greater quantities of paper used in overseas shipments and lost for reuse

5) Collection difficulties caused by inclement weather

6) Continued public apathy

The Conservation Committee of the Waste Paper Consuming Industries operating through the War Activities Committee of the Pulpwood Consuming Industries has issued the following release which includes pertinent and up-to-the-minute facts and figures on this serious situation:

Increase in Military Demands

"The War Production Board informs us that the 1945 requirements for military items produced by the pulp and paper industries cannot be fulfilled unless more wastepaper and increased quantities of pulpwood of the desired species and specifications are produced and delivered to the mills.

"Indications are that military requirements for paper and paperboard will not decrease for some months after the end of the European war, while the same requirements for the Pacific war will rise sharply as the conflict with Japan grows more intense.

"When the European war ends it will be necessary to maintain armies of occupation for many months and paper will be needed to package and wrap all the food, clothing and medical supplies used by these forces. This subsistence material even now takes 30 per cent of the shipping going overseas.

"Stores of military supplies in Europe, after the fighting ends, will have to be repackaged for shipment to the Pacific. This is necessary to protect the stores against conditions of the tropical climate, and vast quantities of paper and paperboard will be needed for this purpose alone.

"And the needs for paper to rehabilitate liberated countries will also increase the pressure for greater production in 1945.

Less Wastepaper Available

"We must not lose sight of the fact that every month there is less and less wastepaper to be salvaged. None of the paper or paperboard shipped overseas is brought back to this country, and the vast tonnage of such shipments constantly drains the available supplies of wastepaper.

"Thus, the efforts of every civilian to save wastepaper and make it available for collection should be redoubled. Not a single pound of paper should be burned or needlessly destroyed. To effect this, the U. S. Victory Waste Paper Campaign is intensifying its program. This campaign is conducted by the American Newspaper Publishers Association through an executive committee composed of Edwin S. Friendly, general manager of the *New York Sun*, as chairman, Tom Cathcart of *This Week* magazine, H. B. Fairchild of the *New York Sun*, and Cranston Williams, executive director of the ANPA.

"A number of civic, social and government agencies co-operate actively with some 17,000 local salvage committees and newspapers to make this campaign successful.

"The Periodical Publishers National Committee will throw the power of some 1,500 field workers in back of the campaign beginning January 1 and a number of other trade associations are working with members and the public to intensify the program.

"In 1944, volunteer efforts accounted for about 40 per cent of the wastepaper collected, and according to the Salvage Division of the WPB, collections were increased by about 764,000 tons over 1943 receipts. Even so, the nation fell far below the quota of 8,000,000 tons, which was set by the WPB at the beginning of the campaign.

"During the year a number of mills were forced to operate on a part-time basis for lack of wastepaper, and at present the eastern mills report that wastepaper consumption is three per cent greater than receipts. This ratio makes it necessary to dig into reserve inventories, seriously depleting supplies.

Pulpwood Production Slumps

"Although mill receipts of domestically cut pulpwood during the first nine months of 1944 were encouraging, a sharp production decline since September in some regions and dwindling inventories constitute a serious threat to 1945 wood pulp production.

"Thanks to the active co-operation of the newspapers, the farm press, county agents, foresters, farm groups and government agencies, the pulp and paper industry has been able to fulfill most of its wartime obligations in 1944. But unless pulpwood production can be stepped up during the early winter, some mills will have to close or curtail operations before spring. This is the season when mills should be building up wood inventories against winter conditions that make transportation difficult if not impossible.

"There is no shortage of wood to cut, but there is a serious shortage of manpower and transportation. The U. S. Victory Pulpwood Campaign aims at overcoming these shortages. The War Activities Committee in advertising every month in 825 weekly and daily newspapers and co-ordinates industry activities with those of other interested groups.

"Co-operating in the pulpwood drive are the ANPA Newspaper Pulpwood Committee, of which Walter M. Dear, publisher of the *Jersey Journal*, Jersey City, is chairman, the Farm Press Forest Products Committee headed by Irving Ingalls, of the *American Agriculturist*, Ithaca, New York, and the Periodical Publishers National Committee whose managing director is Arch Crawford, of the Curtis Publishing Company.

"Unless pulpwood production can be increased during the early winter, some mills will have to curtail or cease operations early in 1945.

"The Commerce Department this month reported that 'the bottom of the barrel' has been reached in wood pulp inventories. October inventories were 30 per cent under a year ago and about 62 per cent below October, 1942. Inventories have been gradually declining since the middle of this year.

PAPER · · · America's 6th Industry

PAPER AIR STRIPS

(NEWS ITEM: *A new asphalt-treated paper and cloth surfacing material is replacing steel matting for emergency landing strips.*)

AAF engineers built and restored air fields in northern France using a new asphalt-treated paper and cloth surfacing material for landing strips. This material consists of a layer of cotton cloth sandwiched between two layers of heavy paper thoroughly impregnated with asphalt to make it waterproof. It can support planes as heavy as fighter-bombers.

Moisture-proof paper bags for ammunition . . . Absorbant paper for gas masks . . . Grease-resistant paper for food . . . Insulation paper for cables . . . New uses for paper, calling for new standards of lightness and toughness, new standards of quality in performance. New responsibilities—new opportunities for the Pulp and Paper Industry.

Without interfering with the War Effort, research and development activities of The Pusey and Jones Corporation have continued. The war has accelerated many improvements in methods, materials, machinery and processes. It is the aim of our Research and Development Committee in studying these improvements, to incorporate as many of them as possible in our Paper-Making-Machinery.

The Pusey and Jones Corporation are now in a position to repair or modernize existing machine installations due to the lifting of restrictions by WPB. At present we are working on several modernization jobs. We have prepared three informative articles: "The Post-War Fourdrinier," "Development of the Stream-Flow Vat System," "The Flow Spreader." Ask for reprints by name.

THE PUSEY AND JONES CORPORATION
Established 1848. Builders of Paper-Making Machinery
Wilmington 99, Delaware, U. S. A.

THE SIGN OF SUPERIOR QUALITY

"Although pulpwood production up until early fall reached the highest point since May, 1942, consumption has kept a jump ahead of new supply because of the pressing wartime needs for wood pulp. Inventories consequently have dwindled.

"Total domestically-cut pulpwood, delivered to the mills, probably will exceed 15,000,000 cords in 1944 — 2,000,000 more cords than in 1943 — as a result of the combined efforts of groups engaged in the U. S. Victory Pulpwood Campaign.

"It will be seen from these facts that immediate action must be taken to collect wastepaper and cut pulpwood in order to prevent the war production schedule from breaking down. It is likely that the pulp and paper industries will be one of the last major consumer goods industries to achieve a production level equal to demands."

PULP ALLOCATIONS FOR FIRST QUARTER ANNOUNCED BY WPB

Announcement has been made of pulp allocations for the first quarter of 1945 amounting to 2,681,650 tons for the manufacture of paper and paperboard. An additional 171,000 tons is allocated for non-paper uses. Of this total 61,281 is authorized for export. In making this allocation, the Forest Product Bureau has estimated that it will be sufficient, with other fibers, for the production of 2,030,000 tons of paper and 2,371,963 tons of paperboard.

Meanwhile an estimate made by experts of the War Production Board indicates an expectation of nearly 10 per cent increase in production in two years after V-E Day, over the industry's previous peak in 1941. This statement forecasts a production of the unprecedented total of 20,070,000 tons in the second year following V-E Day, or 2,000,000 tons more than the 1941 record. A considerable portion of this demand will be for paper for educational purposes, and commercial use without which reconversion of the nation's economy from war to peace could not be accomplished. An extremely heavy demand from occupied countries is becoming evident even now.

The War Production Board does not expect an immediate return to the prewar totals of imports of pulp from Scandinavia, because of the demand which will be experienced from countries other than the United States. The WPB estimate is that pulp imports will not total much over 500,000 tons per year for several years after peace, while in 1937 such imports from Scandinavia were over 1,500,000 tons. At one time, the Foreign Economic Administration asked for large quantities of paper for export in the first quarter of 1945, but in view of the pulp situation, this demand was withdrawn before the time came to allocate pulp for that period. The demand for export paper may, however, be renewed for the second quarter.

The wood shortage in the Southern states is becoming acute, according to reports reaching Washington. Optimism over the end of the war, the fact that farmers had been sufficiently prosperous during 1944 not to feel the need of additional income, and the diversion of prisoners of war to agricultural work combined to cut down the output, which has hampered the operations of several southern mills.

▶▶▶ A CONVERTER of paper products is anyone who manufactures any such products from pulp, paper, or paperboard, altering their original characteristic forms. This revised definition has been amended by the WPB in Conservation Order M-241 (a). Formerly, the definition included anyone who manufactured or *assembled* any converted product. Since assembling is not a converting operation, it was eliminated from the definition.

▶▶▶ AN IMPORTANT War Production Board personnel change has been formally announced, under which Harold Boeschenstein, previously acting director of the Forest Products Bureau was advanced to Operations Vice Chairman of the Board. He succeeds Hiland G. Batcheller, who was made Chief of Operations, to handle broad policy problems and act as Chairman during Chairman Krug's absence from Washington.

▶▶▶ THE RESIGNATION OF Edward R. Gay, assistant vice chairman for Civilian Requirements, became effective on January 2. However, Mr. Gay has consented to serve in the future as a consultant to the board whenever needed. Having gone to the WPB in June, 1942, Mr. Gay ranks among the first of many executives who gave up their peacetime positions to assist the Government during the war period. Before going to WPB, Mr. Gay was vice president and director of the St. Regis Paper Company, New York City.

▶▶▶ CHESTER BOWLES, head of the Office of Price Administration, discussed paper industry problems in detail with a group of well-known paper mill executives on December 14, and was told that the industry hoped the OPA would co-operate with the mills to prevent a decline of pulp and paper production because of shortages or uneconomic situations. There was some discussion of a proposal that an Advisory Committee be formed to confer with the OPA on matters covering the entire paper and paperboard industry, without interference with the special problems facing individual group advisory committees.

DAVID GRAHAM RESIGNS FROM WPB AS CHIEF OF PULP ALLOCATION

Effective December 20 David Graham resigned as chief of the WPB Pulp Allocation Office. The Forest Products Bureau regretted losing Mr. Graham at this time, but the state of his health made it necessary for him to leave the board.

Robert Evans, of New York City, assistant chief of the Pulp Allocation Office for the past three years, has been designated to act as Mr. Graham's successor.

▶▶▶ THE NEW DIRECTOR of the Paperboard Division of WPB is Ralph A. Powers, of New London, Connecticut. The new appointee succeeds Arnold B. Huyssoon, of Maywood, New Jersey, who is returning to the Continental Paper Company. Mr. Powers is president of the Robertson Paper Box Company, having been associated with that company since 1921.

▶▶▶ A STIPULATION has been reached between the Federal Trade Commission and the United Paperboard Company under which the United's so-called "Cedarboard" must not be so marked as to indicate that it is composed wholly of cedar. Labels must indicate that the product does not consist entirely of cedar when part of the materials used are other components.

"Sounds like they are getting ready to make SEYBOLDS again"

Some of these days we WILL be making Seybolds again for civilian use—so help us anticipate your needs by sending in your reservation NOW.

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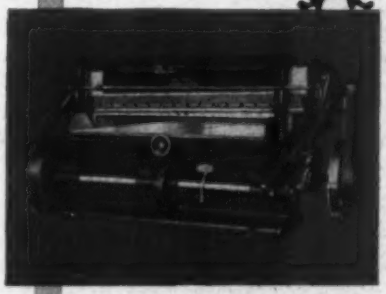
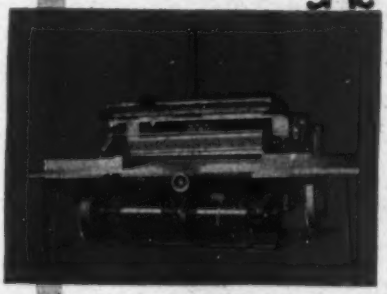
I'm a precision *machine*
Of massive design.
For accuracy—tops!
For speed—super fine!



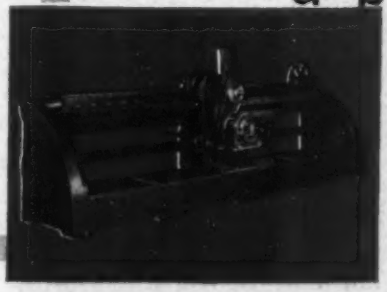
SPACER

For making a series
Of accurate *cuts*
I'm a time-saving guy
With plenty of guts!



GRINDER

Keen, true edges
That's my trade
With minimum waste
On any straight blade!



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DIVISION

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City.....*State*.....

RESTRICTIONS ON PAPER MILL MACH'Y MODIFIED BY THE WPB

Paper mill machinery restrictions were modified by the War Production Board on December 11. This was effected by amendment to Order L-83 which removed restrictions on used and reconditioned machinery. As amended, the order restricts delivery of new paper mill machinery only. For the delivery and acceptance of new paper mill machinery, authorization must be obtained on Form WPB-1319 or GA-1456.

The amended order also removes the limitation, formerly $2,000, for repair and maintenance parts that can be obtained with MRO ratings, but the use of these ratings must be confined strictly to the maintenance and repair parts as defined in CMP-5, paragraph (b).

"Paper mill machinery" is defined in the amended order as all new machinery and equipment used in the production and processing of pulp, paper, and paperboard, including containerboard, and converted paper products, with specified exceptions. The exceptions are: machinery for the manufacture of fiber shipping containers, folding cartons, and set-up boxes, formerly controlled by Order L-332, recently revoked, and printing trades machinery defined in Order L-226.

◆

PRICE BROS. OFFERS FOUR SCHOLARSHIPS

In order to encourage both the study of scientific methods of forest conservation and bilingualism, Price Bros. and Company, Ltd., has donated four scholarships to the School of Civil Engineering and Surveying of Laval University, Quebec. Announcement to this effect was made on December 6 by the Quebec Forestry Association, to which organization Col. C. H. L. Jones, president of Price Bros., turned over the matter during the recent convention of the Association at Quebec.

Under the conditions, the candidates for one of these scholarships will write in what for them will be the secondary language. That is, French-speaking students will write in English, and vice versa. Competitors will be given a choice of subjects including (1) most effective methods of combating the insect pest; (2) chemical, mechanical, and sylvicultural control of the forests, forest operations as regards sylviculture and cutting, and also the interdependence of cutting and sylviculture.

The contest will end by July 1, 1945, and the theses will be judged by a jury of technicians made up of one English-speaking member who will represent the Forestry Association, a representative of the industry, and a specialist in each of the subjects mentioned for the competition. The first prize will be $100, the second prize of $50 for each category of subjects, and two prizes for competitors presenting their theses in English and two for those presenting them in French.

◆

"QUEBEC FORESTS NOT INEXHAUSTIBLE" SAYS FORESTRY MINISTER

On the present basis, the forests of the Province of Quebec will last only another fifty years. That statement was made by the Hon. Johnny S. Bourque, Quebec Minister of Lands and Forests, at the annual dinner of the Quebec Province Wholesale Lumber Association, held in Montreal on December 20. The Minister also said that the people had better get rid of the old idea that the forests of the Province are inexhaustible.

He brought out that the Quebec government is very much alive to the conditions and already it has launched plans for correcting the evils, some of which plans provide for co-operation of other provinces and even with the United States, since the Government in Washington has agreed to send some of its expert engineers into the Province to work with Quebec engineers in studying the sicknesses which afflict such a large proportion of trees in Quebec. The experience gained by the U. S. engineers would serve the United States in caring for the forests of Maine, Vermont, and even the forests in the Southern States.

◆

POWER COMPANY BUYS 3 AWP MILLS—IDLE FOR PAST 15 YEARS

Three divisions of the American Writing Paper Corporation, Holyoke, Massachusetts, have been purchased by the Holyoke Water Power Company. Mills included in the purchase are the Beebe-Holbrook, Massasoit, and Wauregan divisions of the AWP company which have been idle for the past fifteen years.

This valuable mill property, located in the heart of the industrial section of Holyoke, will be converted into an industrial center for small industries. The power company also has plans for a postwar development of a public heating plant on the site.

A few years ago the American Writing Paper Company considered undertaking a modern paper mill development on the site of the three mills, but the outbreak of the war interferred with this plan.

The total assessed valuation of the three pieces of property, with their valuable 24-hour permanent "mill powers," or units of waterpower, is $275,080. The Wauregan division was built in 1879 by the late James H. Newton, one of the pioneer papermakers of Holyoke. The Beebe-Holbrook mill was built in 1872; the Massasoit was built the same year. After the closing of the latter as a paper mill, it was used by the AWP company as an experimental laboratory.

◆

▶▶▶ ORDERS FOR NEW stock preparing equipment to replace its present equipment and provide increased capacity have been placed with the Dilts Machine Works, Fulton, New York, by the Newton Paper Company, of Holyoke, Massachusetts. The Newton company now operates two paper machines, but expects to install another after the war. The new equipment is intended to take care of the proposed increase in production.

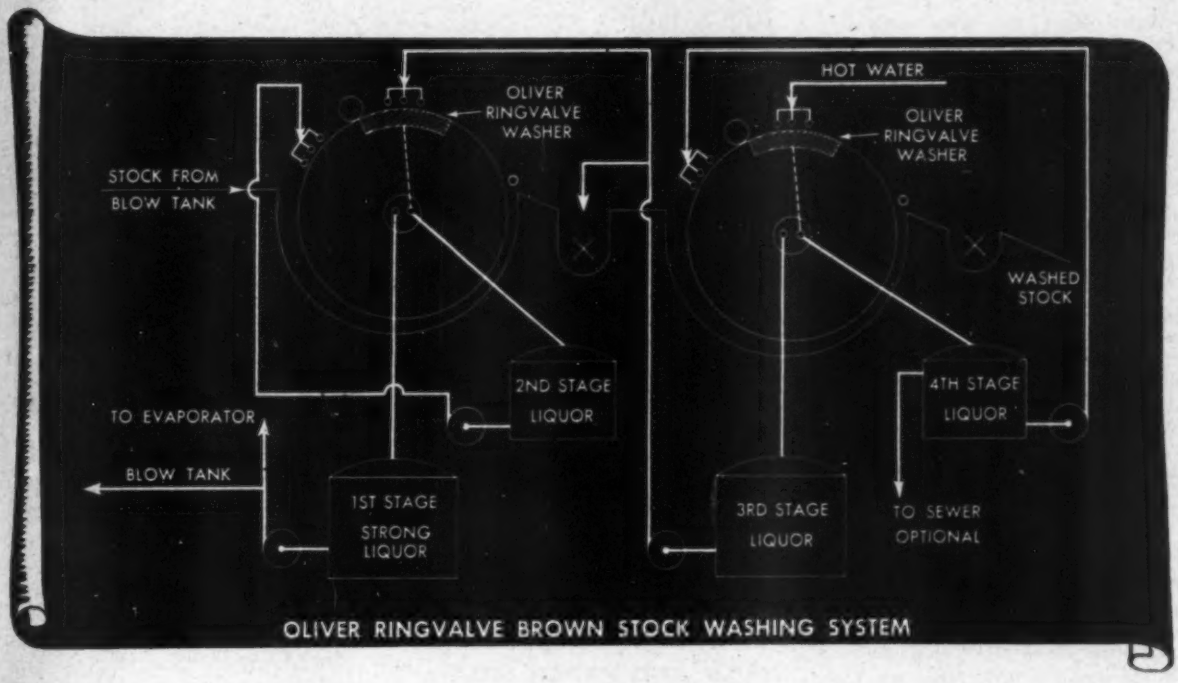
◆

INTERNATIONAL TRADE COURSES TO BE RESUMED

Columbia University announces the resumption of its University Extension courses on International Trade which were discontinued shortly after Pearl Harbor. For the spring session, beginning Monday, February 5, 1945, a course on "Fundamentals of Exporting" will be offered by Morris S. Rosenthal, who was a lecturer at Columbia University for many years prior to his appointment as assistant director of the Board of Economic Warfare. Mr. Rosenthal has resumed his business connection in New York as executive vice president of Stein, Hall & Company, Inc., and vice president of the National Council of American Importers.

The course on "Fundamentals of Exporting" will be given on Monday evenings at 5:50 to 7:30 o'clock, beginning February 5, 1945, and will deal with methods of marketing American products abroad and international trade techniques, including: contract terms, ocean transportation, marine and war risk insurance, customs regulations, foreign exchange, and the financing of international shipments. Consideration will also be given to the significance of international trade to American industry and to American international economic policy.

Flow Diagram of a Recently Ordered 240 TON OLIVER RINGVALVE B. L. WASHING SYSTEM



OLIVER RINGVALVE BROWN STOCK WASHING SYSTEM

FOUR 8′ x 12′ Oliver Ringvalve Black Liquor Washers are to be installed in a twin counter-current washing system, each line to handle about 120 tons per day making a total of 240 tons for the system.

Here are a few of the reasons why Oliver Ringvalves were the choice of the buyer:

1 the ability of two Oliver Ringvalves in series to wash and rewash the tonnage that would normally require *three* ordinary washers plus a rewasher.

2 the ability of the system to produce clean pulp with a minimum of wash water and to recover a maximum of chemicals.

3 the ability of either line to handle up to a 100% overload, if occasion demands, without sacrificing clean pulp.

These advantages are not theories, *they're facts.* The Oliver Ringvalve long ago proved its great economic and operational superiority as a black liquor washer.

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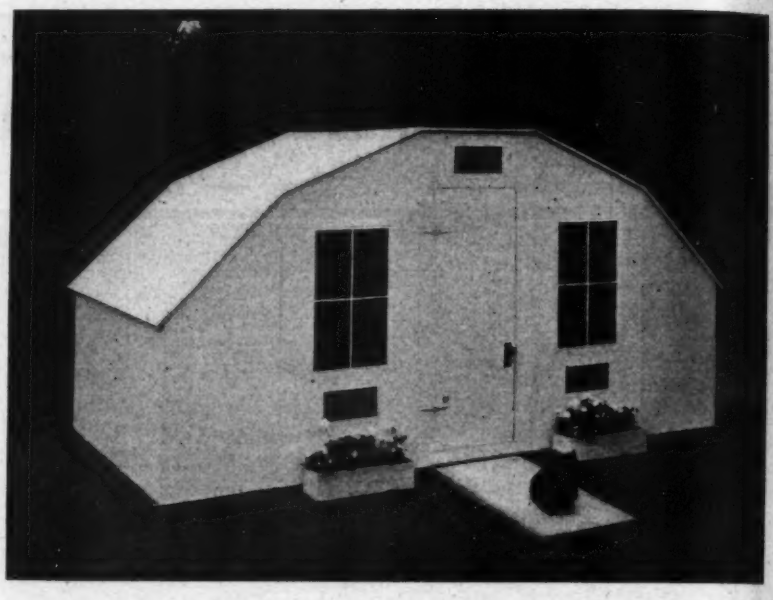
TEMPORARY HOUSE MADE FROM WASTEPAPER IS TESTED AT INSTITUTE

Out of the experimental work developed at the Institute of Paper Chemistry, Appleton, Wisconsin, has come *a paper house*. This idea developed from the great need for temporary homes throughout the world to house people left homeless by the onslaught of war.

Although the work is still in the experimental stage, one of the paper homes has stood on the grounds at the Institute for several months for a weather test. The house is made from papers such as are collected in the wastepaper drives.

Pressed panels of wastepaper to fit specifications for a house can be assembled into a house in approximately 59 minutes. The cost will run less than $110. Such a structure provides room for four persons, and will stand through four seasons, lasting a full year, perhaps longer. The material for such a temporary home will make a package weighing 1,029 pounds.

This paper house is one of several types the government is considering as a solution for the shelter needs of people without homes until there is time, and available material to build permanent houses. Plastics, plywood, and corrugated metal also are being used in competitive research. The chipboard paper house developed by the Institute is one of the lowest in cost.



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▶▶▶ THE TRANSFER of the paper mill and property at Fort Edward, New York, from the International Paper Company to the Scott Paper Company has been completed, and the new owner took over on January 1. Work of preparing the plant for operations will be started at once.

◆

SMOKELESS POWDER FROM SULPHATE PULP

A new process has been perfected to manufacture smokeless powder from sulphate pulp, according to a recent announcement by the Western Cartridge Company, given out with permission of the War Department.

Western Cartridge Company has conducted ten years of research on this process. Kraft pulp produced by its process in the plant of the Gaylord Container Corporation at Bogalusa, Louisiana, has been shipped in experimental lots to government plants at Radford, Virginia, and Charlestown, Indiana, where it has been successfully nitrated and manufactured into smokeless powder.

Research into the new process has been carried on by Dr. Fred Olsen, internationally known explosives expert, who is research director of Western Cartridge Company.

◆

PULP AND PAPER MILL PROPOSED BY EAGLE LAKE SAWMILLS, LTD.

W. B. Milner, president of the Eagle Lake Sawmills, Ltd., of Prince George, British Columbia, announces that the company proposes to spend three to four million dollars on a pulp and paper mill of about 200 tons daily capacity. It is understood the mill will utilize pulp timber from hundreds of square miles along the northern Canadian National Railways. More than a billion feet of Canadian white spruce and pine is believed available, spruce predominating.

The mill plans utilization of waste products from the Giscome sawmill and from other mills in that part of the province. It is reported there are 115 sawmills on the C. N. R. which are unable to make full utilization of their timber stands for lack of market for non-commercial timber.

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▶▶▶ MANAGERS OF WPB forest products district offices at Portland, Maine, Manchester, New Hampshire, and Montpelier, Vermont, were advised the latter part of the year to invoke high rating classifications of laborers for cutting lumber and pulp. Emphasis was placed on the need for woods labor.

FOREST IND. COUNCIL SPONSORS CONFERENCE OF WOOD USING GROUPS

Under the auspices of the Forest Industries Council, a conference of pulp and paper producers and lumber manufacturers was held at the Blackstone Hotel in Chicago December 12.

An important feature on the agenda of the meeting was the reading of reports from the state chairmen of the Forest Industries Information Committee. Of special interest were the reports from Minnesota and Wisconsin. L. A. Furlong, M and O Paper Company, and chairman of the Minnesota Committee, reported in detail activities in connection with the legislative interim Committee concerning recommended reforms in state tax legislation necessary to encourage the private growing of timber, adequate appropriations for the Minnesota Division of Forestry, and plans for better forest fire control. He described the publicity campaign of education directed to the citizenry of Minnesota wherein he stated the value of pulpwood processed in Minnesota during 1943, plus other forest products shipped out of the State, amounted to an estimated 75 million dollars.

In the absence of Folke Becker, Rhinelander Paper Company, chairman, Harold S. Crosby, secretary, read the Wisconsin report. This report described studies made in connection with Wisconsin forestry and told of a recent stimulated interest in the field of private forestry, particularly by the pulp and paper companies. The effectiveness of fire control in Wisconsin rendering standing timber a good risk, certain tax reforms in the past with

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others in prospect, and the need for contiguous timber supply have combined to produce a real leadership in industrial forestry. The plan of organizing and certifying "Industrial Forests" in co-operation with the Wisconsin Conservation Department, bore out this assertion, with applications already received covering about 200,000 acres.

Other reports came from chairmen from Tennessee, the Carolinas, Georgia, Louisiana, New England, and the Western timber states.

Chairman of the Forest Industries Council is Frederick K. Weyerhaeuser of St. Paul. Chairman of the Forest Industries Information Committee is E. W. Tinker, executive secretary of the American Paper and Pulp Association. Secretary of the Committee is Donald M. Rochester.

◆

IDAHO-MONTANA PULP AND PAPER CO. PLANS MILL AT POLSON, MONT.

W. F. McNaughton, of the newly established Idaho-Montana Pulp and Paper Company, Couer d'Alene, Idaho, says the firm expects to build its second pulp mill at Polson, Montana. The first mill will be built at Couer d'Alene.

The corporation contemplates an authorized capital of $50,000 at the outset, with provisions for increasing capitalization to $1,500,000, and to provide for bonded indebtedness of $2,000,000.

◆

FINANCIAL

Despite a general weakening of securities prices following the German offensive in the Franco-Belgian region, and the usual drop in prices with the year end tax selling, paper mill stocks in general showed slightly higher figures at the end of December than in the latter part of November.

A. P. W. Paper Company—The name of this company has been changed to the A. P. W. Products company in order to facilitate the handling of additional products outside the paper and pulp manufacturing field. Outstanding bonds totaling $2,000,000, carrying 6 per cent will be redeemed and a new issue of the same amount at 5 per cent will be issued. For the sixteen weeks ending October 21 the company reports a net profit of $29,176, as against $11,535 for the comparable period in 1943.

Crown Zellerbach Corporation—Net income for the six months ending October 31 was $3,596,493 as against 3,767,883 for the like 1943 period.

Champion Paper & Fibre Co.—Net profit for twelve weeks ending November 12 was $461,502, and for twenty weeks ending the same date $1,072,-937.

Eastern Corporation—A bond issue of $2,500,000 has been placed with two insurance companies, the bonds carrying 3¾ per cent, due 1959. The proceeds will be used to redeem outstanding 5 per cent bonds and all outstanding 5 per cent preferred stock.

Rayonier, Inc.—Net profit for the six months ending October 31 was $900,277 as compared with $891,803 for the same period in 1943.

West Virginia Pulp & Paper Company—Net earnings for the fiscal year ended October 31, 1944 were $2,383,-587 as against 2,610,496 for the preceding year.

New York Stock Exchange—Stocks

	Closing Prices Dec. 26	Nov. 25
A.P.W. Paper Co.	4⅜	*3½–3¾
Celotex	14⅜	14
Same Preferred	19	18¾
Certain-teed Products	6⅞	7⅛
Same Preferred	125	129¼
Champion P & F Co.	* 29–29½	30
Same Preferred	*113–114	*113¼–114
Container Corp.	28½	27½
Cont. Diamond	11¼	*10⅝–11
Crown Zellerbach	21¾	20½
Same Preferred	*103⅛–103⅝	103½
Dixie Vortex	18	*17⅛–17⅝
Same "A"	*47¾–48¼	48½
Robert Gair	4⅜	4⅜
Same Preferred	15⅞	*15½–16½
Gaylord Container	*21¼–21¾	20¼
Same Preferred	*57½–58½	*64–56
International Paper	20	18⅞
Same Preferred	93	89¾
Kimberly-Clark	*37½–38	37½
McAndrews & Forbes	28¾	27
Masonite	40⅛	40¾
Mead Corp	12⅝	11¼
Same Preferred	*99–100	100
National Container	13¼	11⅜
Paraffine Cos	56	58
Same Preferred	109	106
Rayonier Inc.	16¾	15½
Same Preferred	34–34½	33½
Scott Paper	*40⅜–42	44½
Same 4½% Pref.	*102–114½	115
Same 4% Pref.	*109–111	*108–112
Sutherland Paper	*32–33	*30–31¾
Union Bag & Paper	14¾	14
U.S. Gypsum	77¼	76½
Same Preferred	*180–183	*182–186
West Va. P & P Co.	23¼	*23½–24
Same Preferred	*109½–110	*109–110

New York Stock Exchange—Bonds

Abitibi 5%	109	98¾
Celotex 3¾%	.....	105¼
Certain-teed 5½%	101½	102
Champion P & F Co.	.....	.....
Internat'l Paper 5%	.....	.....
Same 6%	106⅜	107½
West Va. P & P Co.	.....	.....
Same Preferred	.....	

New York Curb Exchange—Stocks

Great Northern	.....	.....
Hummel Ross	6¾	7
St. Regis	5¾	5⅜
Taggart	5¾	.....
United Wall Paper	4⅜	4

*Closing Bid and Asked Prices

LONGVIEW FIBRE PLANT PRODUCING PAPERBOARD OVERLAYS FOR PLYWOOD

The plant of the Longview (Wash.) Fibre Company is now producing paperboard overlays for use in the new plywood product developed at the Hoquiam (Wash.) plant of the Harbor Plywood Corporation.

Impregnated paper, or paperboard overlays, make it possible to use imperfect veneers. This covering of the wood by a paper, made as strong as plywood by use of chemicals, eliminates grain raising, as well, and provides a better surface for painting, according to paper researchers. The paperboard overlays from the Longview Fibre plant are treated with just sufficient resin in the sheet to bond the adjacent fibers, one to another. The new Hoquiam product is called Super-Harborite. Its applications have been confined to military uses and pilot plant domestic uses, which have demonstrated great strength and weathering characteristics.

◆

HOWARD SMITH MILLS REGARD LIGNIN-VANILLIN VENTURES SUCCESSFUL

In connection with the new plant of Howard Smith Paper Mills for the production of lignin plastics by the use of lignin extracted from waste sulphite liquor, officials of the company have stated that this lignin plastic will be unlike that made elsewhere.

The company also states that its other venture in the production of an important by-product from wood pulp; namely, vanillin, used as a base for flavoring extracts, has proved so successful that a sufficient quantity for all Canada's requirements is now being produced, and in addition the company is able to ship a certain amount to the United Kingdom.

◆

CONTAINER CORP. HAS PLANS FOR NEW PLANT AT GREENSBORO, N. C.

Container Corporation of America, through its Eastern Division, has announced plans for the construction of a new manufacturing plant in Greensboro, North Carolina.

Land has been acquired for the projected factory and plans for construction have been completed. Professor Walter Gropius of Harvard University, an authority on industrial architecture, was engaged as consultant in this planning. It is believed that the plant will be one of the most

modern in the industry. Working quarters, ventilation, and all other facilities have been designed to provide the maximum of comfort and efficient conditions for employees.

When in operation, the plant will manufacture folding cartons and corrugated shipping containers for the industrial markets in the South.

◆

▶▶▶ THE HIGHEST AWARD of the National Victory Garden Institute has been given to the Brown Company, Berlin, New Hampshire. A letter from the Institute, accompanying a plaque, was sent to S. D. Story, Victory Garden chairman, in recognition of the distinguished record of the firm in encouraging victory gardens during 1944.

◆

WAR ACT. COMM. IS HELPED BY THE PULP CONSUMERS ASS'N

The Association of Pulp Consumers, Incorporated, has contributed $10,000 to the War Activities Committee of the Pulpwood Consuming Industries for use in its campaign to stimulate the production of pulpwood. This amount is in addition to the $50,000 which the Association contributed about a year ago. In making the contribution, Dwight L. Stocker, President of the Association, stated that the Association was very glad to again contribute to the important work of the War Activities Committee of the Pulpwood Consuming Industries.

The Association of Pulp Consumers represents two hundred and seventy-seven paper and paper board mills which depend on purchased wood pulp. They have been co-operating with the governmental agencies and the domestic pulp producers in their various efforts to increase the production of pulpwood.

◆

▶▶▶ A COMMITTEE REPRESENTING stockholders of Abitibi Power and Paper Company met in Toronto December 31 and reached an agreement on the securities the 7 per cent shareholders will receive in the reorganized company. They will receive five shares of $20 par value, callable at $37.50, and carrying cumulative dividends of $2.50 from January 1, 1945.

◆

▶▶▶ FOREST FIRES destroyed 11,464 acres of timberland in Arkansas during the past five months. A total of 1,132 fires were reported in the State during this period.

Products of CLARK • TRANSMISSIONS • ELECTRIC STEEL CASTINGS AXLES FOR TRUCKS AND BUSES • AXLE HOUSINGS • BLIND RIVETS INDUSTRIAL TRUCKS AND TRACTORS • HIGH-SPEED DRILLS AND REAMERS METAL SPOKE WHEELS • GEARS AND FORGINGS • RAILWAY TRUCKS

Now he buys YARDAGE *— as against weight*

The printer is not the only one who has discovered that opacified light-weight papers impose no war-time hardship. He likes them, and so do all types of paper users who find many advantages in them which the pre-war heavier papers did not possess. The buying of paper by area instead of by pounds may become a permanent practice.

In this situation the notable characteristics of TITANOX pigments stand out as a beacon light to guide the paper manufacturer. Their unexcelled opacity, whiteness and brightness permit production of the kinds of paper favored by consumers—papers of unimpaired strength and with fine printing or writing surfaces—papers that resist after-yellowing.

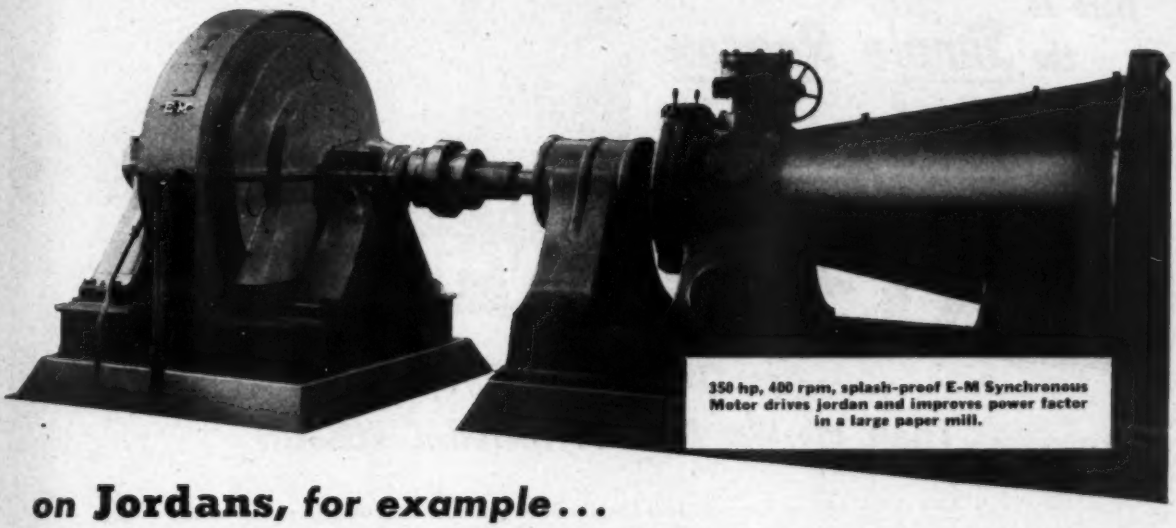
Perhaps you would like to discuss your post-war plans with our Paper Service Department. We will be most cooperative.

TITANOX
REG. U. S. PAT. OFF.

TITANIUM PIGMENT CORPORATION • *Sole Sales Agent*
111 Broadway, New York 6, N. Y. • 350 Townsend St., San Francisco 7, Cal.
104 S. Michigan Ave., Chicago 3, Ill. • 2472 Enterprise St., Los Angeles 21, Cal.

TITANOX
REG. U. S. PAT. OFF.

Paper Mills get DOUBLE VALUE from E-M SYNCHRONOUS MOTORS



350 hp, 400 rpm, splash-proof E-M Synchronous Motor drives jordan and improves power factor in a large paper mill.

on Jordans, for example...

VALUE 1—E-M SYNCHRONOUS MOTORS PROVIDE THE MOST EFFICIENT DRIVE

You can't select a *better* motor for a jordan drive than a "built-for-the-job" E-M Synchronous Motor. Direct-connected to the jordan, these high-torque, easy-starting motors provide smooth, powerful, constant-speed operation unaffected by load or voltage variations. Because they operate at high efficiency you get the lowest power cost... because of their rugged construction you get the long life, dependable motor service you need for trouble-free jordan operation. Splash-proof and drip-proof protection is available for wet locations.

VALUE 2—E-M SYNCHRONOUS MOTORS OFFER EXTRA ECONOMY IN IMPROVED POWER FACTOR

Because they are built to operate at *unity* or *leading* power factor, E-M Synchronous Motors on your jordans can *help reduce your power costs and improve the efficiency of power system.* This is a plus-value in performance in addition to the drive. It helps compensate for low power factor caused by other motor drives... helps you maintain unity power factor in mill.

E-M field engineers are specialists of long experience in synchronous motor applications. They can help you take most advantage of these high efficiency motors in *your* mill.

And here are other ways your mill can use

SYNCHRONOUS MOTORS

1. GRINDERS, no matter how large, are best driven by powerful E-M Motors. Assures maximum dependability in performance.

2. CHIPPERS give most tonnage through steady, constant-speed operation of E-M Motors. Unsurpassed for chipper drives.

3. BEATERS driven by E-M Synchronous Motors afford a good means of power factor correction.

4. PUMPS, AIR COMPRESSORS, PULPERS, REFINERS, VACUUM PUMPS, have highest operating efficiency when driven by E-M Synchronous Motors.

ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

Send for Your Copy!

New, 20-page bulletin, "ABC of Synchronous Motors"

"DOUBLE VALUE" SYNCHRONOUS MOTORS

HIGH-SPEED LOW-SPEED ENGINE-TYPE "PACKAGED"

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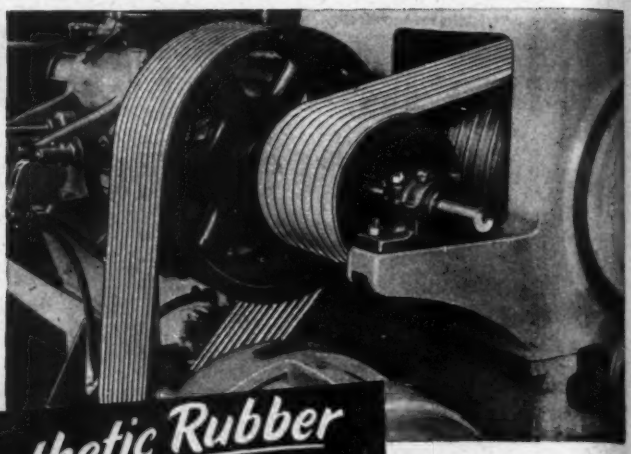


Here Is the ***Simple Reason*** *Why*

GATES *Synthetic Rubber* V-Belts

—Are Giving You Even *BETTER SERVICE* Than *Pre-War Belts* of *NATURAL RUBBER!*

NO ONE, before the war, had ever built a V-Belt that could stand the service now required by the Army's tanks, tractors, and self-propelled big guns. Gates has developed V-Belts that are now serving on army combat units all over the world—and has built these belts of synthetic rubber!

This fact is important to you now because every improvement developed by Gates for these Army belts has also been added, day by day, to the quality of the standard Gates Vulco Ropes which have been delivered to you.

It is only rarely, of course, that improvements developed primarily for army combat use can be passed on immediately to the general user—but there are very good reasons why Gates has not been called upon to withhold these important V-Belt improvements from Industrial V-Belt users.

The plain fact is that no guns, no tanks, no airplanes can be produced unless V-Belts are supplied to drive the producing machines. It is equally clear that better V-Belts than ever before have been urgently needed to keep machines going on the forced-draft, war-production schedules that have had to be maintained 24 hours a day!

That is why Gates has been able to embody in the standard Gates Vulco Rope every V-Belt improvement which Gates specialized research has developed for use on the Army's motorized equipment—and that is why you are finding that your standard Gates synthetic rubber Vulco Ropes are today giving you better service than any V-Belts that were ever built before the war.

THE MARK OF Gates SPECIALIZED RESEARCH

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

CHICAGO 6, ILL. 549 West Washington
NEW YORK CITY 3, 215-219 Fourth Avenue
ATLANTA 3, GA. 738 C & S National Bank Building
LOS ANGELES 21, CAL. 2240 East Washington Boulevard
DENVER 17, COLO. 999 South Broadway
DETROIT 4, MICH. 8663 Grand River Avenue
PORTLAND 9, ORE. 333 N. W. 5th Avenue
DALLAS 2, TEXAS 1710 N. Market Street
SAN FRANCISCO 3, CAL. 1090 Bryant Street

BLACK LIQUOR CAME OUT OF THE RED

. . . when Worthington P. A. E's* found a way to pump it with complete success . . .

Black sulphite liquor—corrosive, abrasive, hot, foamy *and* with a tendency to solidify on cooling—is mighty troublesome to handle, but mighty profitable when handled right.

Black liquor is on the profit side of the ledger, in many mills today, with the help of the Worthington Type CH centrifugal pump—at present the only pump that handles it with complete success.

Valuable by-products for the coming age of "wood conversion" may be under consideration in your mill. When it comes to pumps—get in touch with a Worthington Pump Application Engineer.

"WORTHINGTON BUILDS 'EM ALL"

In addition to solving especially difficult pumping problems, a Worthington P. A. E. is best able to recommend the right pump for you—since Worthington makes *all* sizes and types of centrifugal pumps for *every* pulp and paper process.

Write or call our nearest District Office.

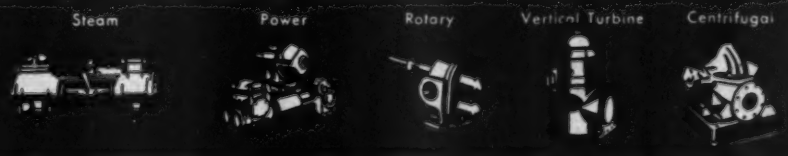
Worthington Pump and Machinery Corporation, Centrifugal Pump Division, Harrison, N. J.

*Pump Application Engineer

BEHIND THE NAME
WORTHINGTON

CP4-19

THE WORLD'S LARGEST MANUFACTURER OF PUMPS



"The Paper Machine Of The Future" as "Imagineered" by Black-Clawson, Hamilton, Ohio.

This is no prediction of things to come, but merely speculation regarding future possibilities in paper production.

What post-war paper machines may look like or how they will operate we have at present no definite idea. We believe, however, that there will be radical advancements in all types of paper mill equipment and that many tradition-bound principles and practices will be superseded.

On one point there is no question; Timken Tapered Roller Bearings will be equal to all requirements in the future as they have been in the past — whether those requirements embrace higher speeds; heavier loads; increased precision; or all together in any combination.

Specify "Timken Bearing Equipped" when buying new paper mill equipment of any kind; and remember *every* tapered roller bearing is not a *Timken* Bearing. To be sure, look for the trademark "TIMKEN" stamped on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TAPERED ROLLER BEARINGS

. . . Editorial . . .

The Year of the Tightened Belt

▶▶▶ HISTORY WILL RESERVE a special place for the year 1944; not because of its beneficence to the people of the world, but for the reason that its kaleidoscopic, record-breaking events have set up mandates of war for most of the peaceful nations of the world. The passing of the year 1944 marked the close of the most turbulent year of the three-year world hostilities.

In the first quarter of that year, this country was at peak production for all commodities necessary to the war effort. In the second quarter, the rumor of revision of war contracts in certain production items began to circulate. In the third quarter — due to D-Day and the spectacular progress of General Patton's army from Brittany to Eastern France — the probable end of fighting by Christmas was widely predicted and used as pre-election, vote-getting propaganda.

Revisions and slowdowns actually took place in many divisions of industry. Then came the election; next, the deadly break-through by the Germans on the Western Front with all of its attendant disappointment and alarm, followed by an all-out resumption of armament production, and the call to colors of all men between the ages of 18 and 37.

The gamut of change and chance, of certainty and uncertainty, of hope and fear brought the year to a close with the business and industrial world in a dither of complexities and anxieties.

We are constrained to ask of the business-wise "What's ahead?"

One thing is certain — as certain as the casualties that are mounting daily — we are destined to conduct a long, tedious, direful mopping-up process of some one hundred and twenty millions of German and Japanese fanatics. That is going to take a long time.

It is now apparent that there is to be no compromise with the Allied terms of "unconditional surrender." Both the Germans and the Japs are being driven back slowly to the confines of their own territories. Their defiance has become something of a challenge to "Come and get us — we will die fighting to the last man."

Whatever it takes to finish the job — in men or costly treasure — the people of the United States will be called upon for a large share.

We are learning, the hard way, the lessons that war is the paramount weapon of evil; it is bankruptingly expensive; the supreme sacrifice of a nation's picked men is a loss to coming generations. War is not to be entered into unadvisedly or without due deference to the laws of God. Also, there must be no abrogation of the Bill of Rights of the common people, for it is they who bear the cost.

The paper industry faces a grim outlook. Supplies of wood and raw materials will be more scarce. Labor will be at a premium, and all costs will go higher with pegged OPA ceilings.

There is little hope of help from Washington. Every mill must sink or swim by its own initiative and on its own resources under federal regulation.

The divisions of over-all production of paper products will start the year on a basis of about 75 per cent for war purposes and 25 per cent to civilian economy. The over-all production for 1945 will be less than in 1944.

In view of all the facts, 1945 is unpredictable, but some probabilities cannot be compared with 1944. We do know that the year ahead will call for greater sacrifices of men, materials, and money. Yes, the year 1945 probably will go down in history as *the year of the tightened belt.*

Paper and Paperboard Predictions

▶▶▶ SOME VERY IMPORTANT predictions in reference to the paper and paperboard situation were cited in a recent release from the American Newspaper Publishers Association. The predictions contained in the release were based on a first-hand inquiry of key Federal officials who were interviewed in the interests of newspapers which have been and are supporting the wastepaper and pulpwood campaigns.

Among the significant facts and forecasts ascertained by the study are the following:

"Army Services of Supply has advised the War Production Board that it expects no appreciable cut-back in military requirements for paper and paperboard products for three to six months after the surrender of the Nazis. Nitrating pulp, now used to make explosives, eventually will be partially released for other essential purposes.

"The repackaging of Army Supplies and equipment for transfer from Europe to the Pacific after V-E Day will require an unbroken flow of paperboard containers and wrapping paper overseas for several months.

"The United States will have to provide container board to the British for packaging military materials to be transferred to the Pacific. Negotiations have just been completed with a British Purchasing Commission to furnish Britain large tonnage of paperboard before April, 1945.

"Liberated countries, particularly France and Belgium, are making demands on this country for paper to enable them to restore civil government and a free press. The United States already is furnishing a substantial amount of paper in Italy.

"War Production Board officials preparing for reconversion of many war plants estimate that private industry will need huge quantities of paper and paperboard immediately after V-E day, and even before, to market many civilian items unavailable heretofore.

"Government officials expect little or no relief in the extremely tight situation by imports of wood pulp from Scandinavian countries until some months after the war in Europe ends.

"Paper products for the first time have been placed in Group 1 of the War Production Board's Material Substitutions and Supply list, indicating its growing scarcity, and container board, paper and paper products were included in a WPB Conservation Division list of materials which will remain scarce after V-E Day."

There are very few mills, if any, which should not give serious thought to these predictions. They indicate the necessity of keeping all mills in best possible operating condition, of making such changes right now in plant equipment as the war situation will permit to obtain the highest production of essential papers, and of making workable, long range plans to become effective as soon as the war is over.

Current Thought

WILLIAM SIBLEY

It Is Safer to Go to War Than to Stay at Home!

▶▶▶ HOW THE ARMY, the Navy and the Marine Corps are successfully training division after division of American boys with scarcely any disastrous accidents is a safety man's dream. Even the training of men with live ammunition whistling overhead, has been singularly unproductive of any serious accidents.

At least a part of this humanized phenomenon properly may be ascribed to the growth of industrial safety, beginning in the mid-thirties,— but there all parentage and similarity ends. Industrial safety was seldom motivated by more than a dollars-and-cents incentive. Lowering an accident rate by applying safety methods meant fewer injuries, lower compensation claims and payments for insurance companies, lower insurance rates for employers. In war, the story is differently written. An injured man, whether his wounds be inflicted by the enemy or accidentally, is a casualty. Casualties take up the time of active personnel at the rate of five to one. Too many casualties can lose a war.

All soldiering is dangerous. Possibly the two most hazardous branches are Ordnance and Engineering. Paradoxically, both branches by-pass danger like a wolf stealing bait from a Canadian trapper. They familiarize themselves with the dangers of their work, then sidestep the pitfalls. One combat engineering regiment (of nearly 2,000 men) reported less than 1 per cent of its hurts were accidentally self-inflicted.

Interesting results sometimes obtain from forethought which makes possible mechanically safe beginnings. A force of construction engineers, building an airfield on a Pacific island, used a number of wire rope operated bulldozers equipped with front end winches. Anticipating hand punctures and blood poisoning to the men handling or guiding the two lines on the winches, the planners ordered preformed wire rope with the result that not one wire puncture has been suffered in 6,000 man-hours of handling. With power shovels, draglines, bulldozers, trucks, tractors, jeeps, heavy gun-carriages, and other paraphernalia, the Army engineers, in one ten-mile radius, have run up a record of 1,700,000 man-hours of work with nothing more than two injuries serious enough to cause loss of working time.

The National Safety Council, in a recent release, pointed out that the death toll from accidents on the home front (since Pearl Harbor) has been running more than two to one over the death toll to American fighting men on all battlefields, put together. From the infamous attack on Pearl Harbor, December 7, 1941, to November 1, 1944, we have suffered 280,000 deaths to civilians from accidents, whereas, in that time, the number of American soldiers killed was 108,897. Of course, no one means to imply that life on the home front is as dangerous as on the battlefront. But as long as industrial accidents are making a poor second-place killer out of war, that condition is a challenge no serious-minded person can ignore.

In speaking of the co-operation given by more than one hundred and thirty national organizations to the National Safety Council in its drive to reduce industrial accidents, Ned H. Dearborn, Council president, said: "The success of this campaign rests, in the final analysis, with the private citizen—the 'GI Joe' of the home front — the man who drives a car, who works in a factory or office, and who otherwise lives the life of an average American. It is our conviction that once this fellow realizes that accidents waste the power Uncle Sam needs for the knock-out blow against the enemy, he will get in there and pitch to help prevent these accidents. . . . If he does, we can cut this terrific accident toll in half; make things easier for the boys in uniform, and bring them back home much sooner. Isn't it worth it?"

For a happier, more prosperous, more *peaceful* New Year — avoid accidents. Your own safety engineer will tell you that eighty per cent of them are needless.

The Comparative Toll Since Pearl Harbor
(As of November 1, 1944)

Casualties to U. S. Armed Forces since Pearl Harbor:

108,897—dead
257,853—injured
63,043—missing
58,099—imprisoned

487,892—total (figures from Army and Navy)

Casualties to Americans on the home front through accidents:

280,000—dead
29,000,000—injured (figures from Nat'l. Safety Council)

Since Pearl Harbor, America's war production program has lost:

800,000,000—man-days through accidents to workers on the job
300,000,000—man-days through accidents to workers off the job

1,100,000,000—total man-days lost

These accidents represent lost time equivalent to the time required to build: . . . 70,000 bombers and 30 battleships!

THE FOURDRINIER. A development of the late 1700's. Same in principle as today's Fourdrinier. Not much development in 150 years except for refinements. First step towards real production.

CYLINDER MACHINE. Almost as old as the Fourdrinier and, like the latter, no radical evolution except in details of construction. Second step towards real production.

HOLLAND BEATER. Also as old as the hills, with today's model about like the earliest designs. Development forced by arrival of early machines. Third big step in paper making.

BREAKER BEATER. Forty years ago continuous beating arrived. That too represented a long step forward; helped make use of mixed papers practicable and high production of board possible.

HYDRAPULPER. Represents radical design change, replacing beaters, speeding pulping operation. Entirely new in principle. Outstanding development of present century, fifth of all time.

GREAT MOMENTS IN PAPER MAKING. You are familiar with the Fourdrinier, the Cylinder Machine, the Beater, the Breaker—but are you entirely familiar with the Hydrapulper? Why not let us explain this revolutionary equipment in detail?

DILTS MACHINE WORKS

FULTON, N. Y.

SHARTLE BROS., MIDDLETOWN, OHIO.
DIVISIONS OF BLACK-CLAWSON CO., HAMILTON, OHIO.

SHARTLE Dilts

NORTON GRINDING WHEEL DIVERSITY

Norton produces grinding wheels up to 48" diameter in the ordinary course of manufacturing—segmental grinding wheels —pulpstones—up to 6' diameter. Diamond wheels and mounted points as small as 3/32" diameter. Making a wide range of sizes as well as innumerable grits, grades and bonds and a variety of structures is part of the Norton business, to supply you with the exact abrasive for your production requirements. Norton abrasive engineers will help you to get top grinding production all the way from pulpwood to the hardest steel alloys.

Norton Company, Worcester 6, Mass.

Behr-Manning, Troy, N. Y., is a Norton Division

NORTON ABRASIVES

SPECIFY "GENERAL CHEMICAL"

for effective pH control and maximum sizing

GENERAL CHEMICAL COMPANY products for the Paper Industry

Muriatic Acid • Sulfuric Acid • Nitric Acid • Glauber's Salts (crystal or anhydrous) • Sodium Sulfide • Sodium Sulfite (anhydrous) • Sodium Bisulfite (solution or anhydrous) Sodium Hyposulfite • Salt Cake • Epsom Salt • Nitre Cake • Aluminum Sulfate (standard and iron free) • Crystal Alum, Potassium • Sodium Aluminum Sulfate • Sodium Silicate • Sodium Metasilicate • Trisodium Phosphate • Tetrasodium Pyrophosphate • Disodium Phosphate

TODAY more than ever, paper makers are insisting on General Chemical "Alum" in their operations because they can rely on its uniformity for maximum sizing and desired pH.

Careful attention to all production details plus constant laboratory control make General Chemical Aluminum Sulfate a product of high quality in its various grades. Specify "General" for your quality paper-making chemicals!

[redacted]

Standard—Lump; Ground 99% thru 8 mesh, 95% thru 10 mesh; Powdered 95% thru 100 mesh.

Iron Free—Lump approx. 2½"; Ground thru 8 mesh.

[redacted]

Solutions: from 38°—60° Baume. Wt. Ratio (Na_2O to SiO_2) from 1:2.00—1:3.40.

Appearance: Opalescent to clear.

BASIC CHEMICALS
GENERAL CHEMICAL COMPANY
FOR AMERICAN INDUSTRY

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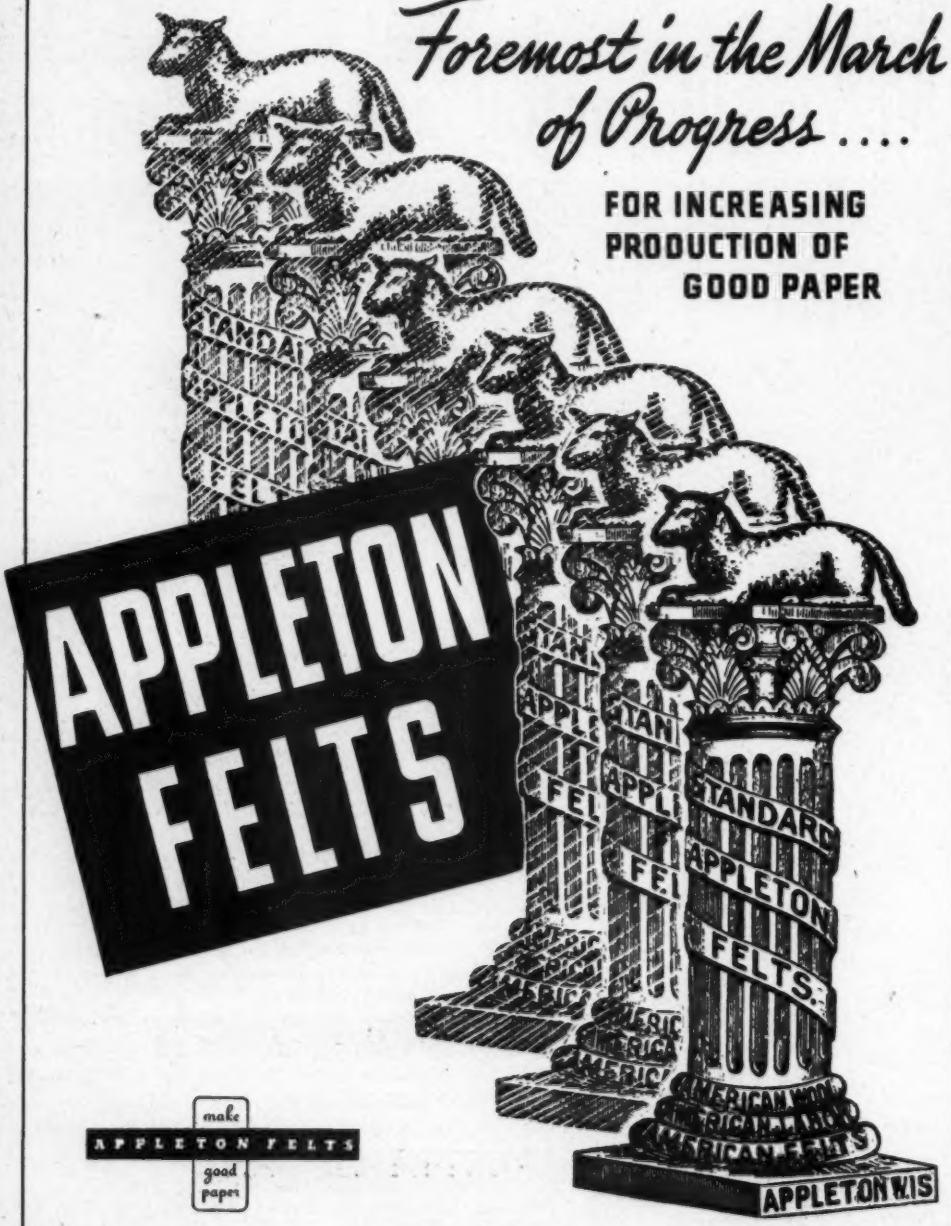
Foremost in the March of Progress....

FOR INCREASING PRODUCTION OF GOOD PAPER

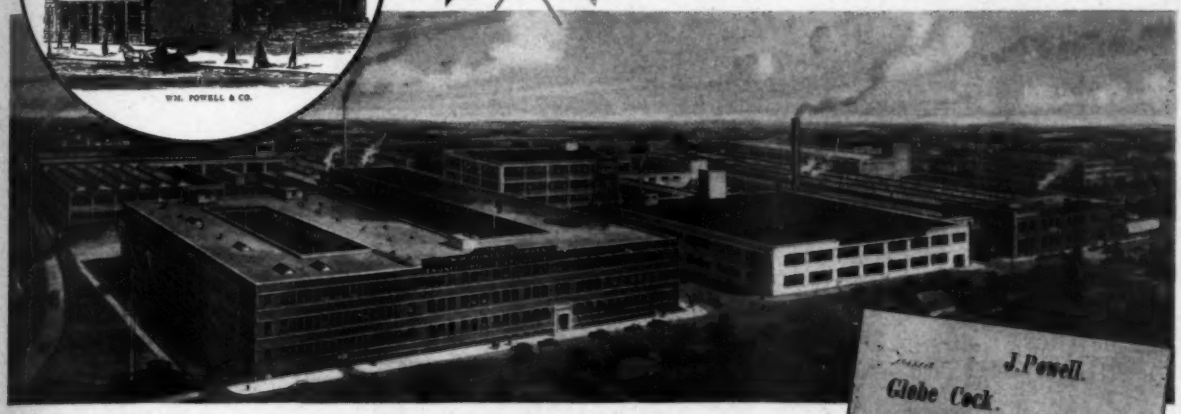


make APPLETON FELTS good paper

Appleton Woolen Mills

APPLETON • WISCONSIN

99 Years of Leadership *in making valves for industry*



In a book on Cincinnati, published shortly after the Civil War, the following statement concerning The Wm. Powell Co. appears—"the Company, founded in 1846, manufactures the celebrated "Star" Regrinding Globe Valve, now in use in all parts of the country." Shown at the extreme right is the drawing used in 1865 to get the patent on this valve. The plant in which these valves were being made at that time is shown in the inset.

Today, in modern plant buildings covering many acres, the company is making a complete line of Globe, Angle, Gate, Check, Relief, Y, Non-return and other types of valves in bronze, iron, steel, pure metals and special alloys for corrosion resistance (catalogs on request).

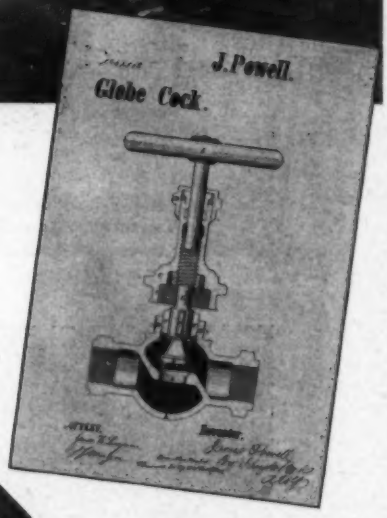


Fig. 1944—Stainless Steel "Y" Valve for 125-pounds W. P. This type of valve provides the straightway full flow area of the Gate valve, plus the throttling feature and easy regrinding and renewability of disc of the Globe valve.

The complete Powell Line of Valves for the Paper Industry includes all types in bronze, iron, steel, pure metals and special alloys for steam, water and all process lines.

Powell Globe, Angle and "Y" Valves can be equipped with the Powell Seat Wiper (patented in 1935)—an ingenious internal regrinding device that assures tight closure of valves handling viscous or gelatinous media or suspensions in solution that precipitate over seat and disc faces. Further particulars will be gladly furnished upon request.

The Wm. Powell Co.

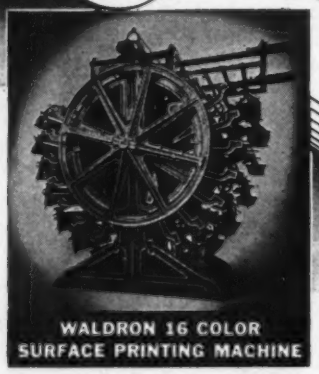
Dependable Valves Since 1846

Cincinnati 22, Ohio

POWELL VALVES

A Century and more of Engineering Experience in Paper Processing

WALDRON "CENTENNIAL" EMBOSSING MACHINE



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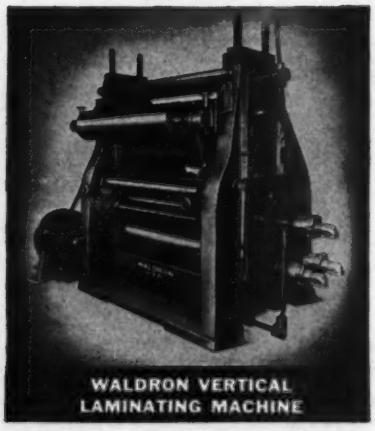

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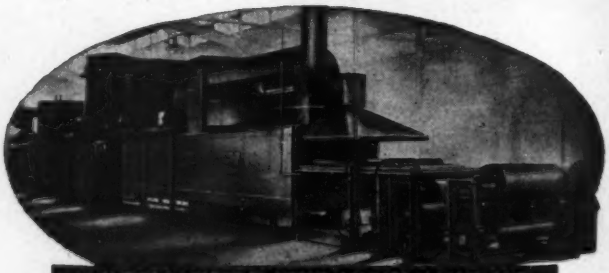

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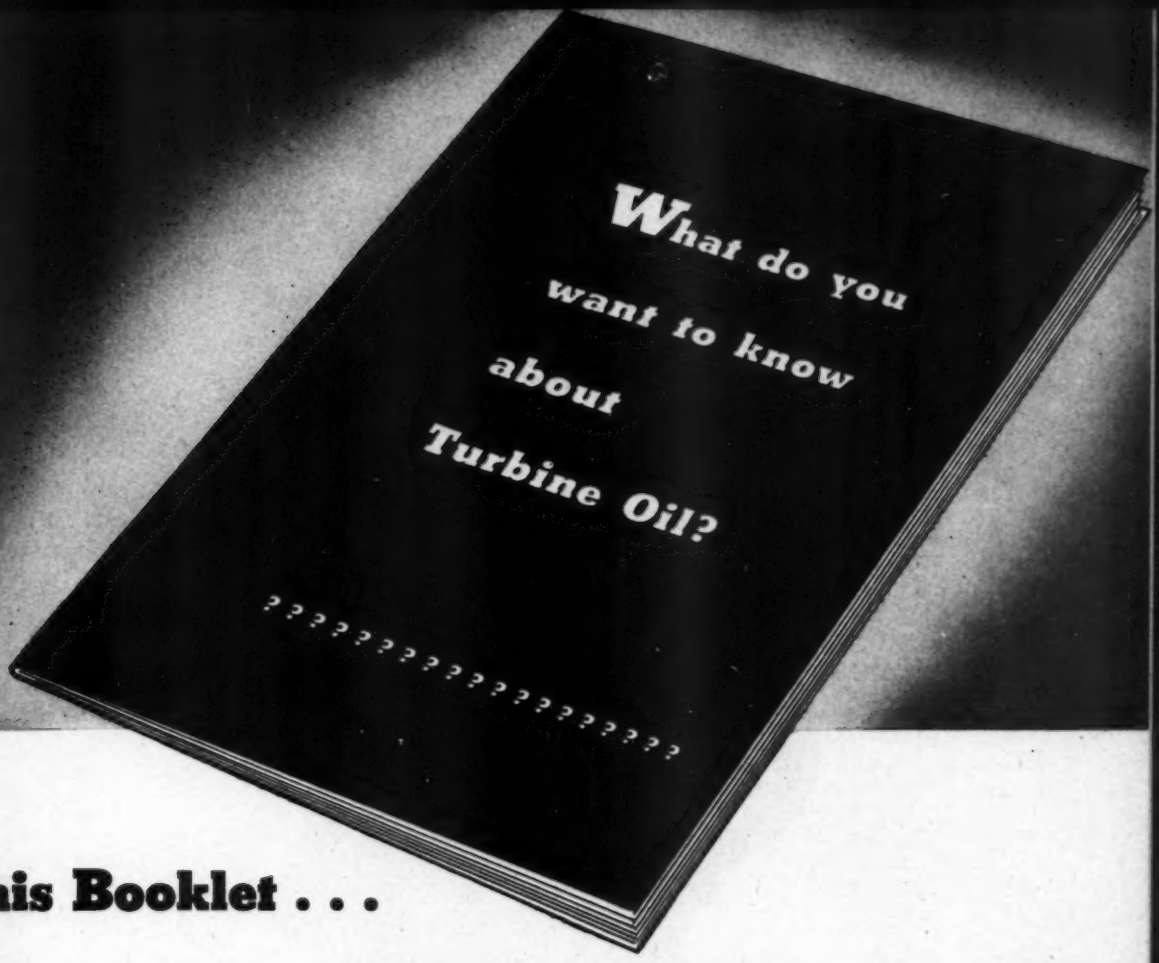

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QUICK, DEPENDABLE SHIPMENT

Paper Converting Machinery—
Its Selection and Development

MAX F. WULFINGHOFF and WM. C. WERNZ

ITEMS OF MACHINERY used to convert paper or pulp from sheet form (or some other form) into literally thousands of consumer products are commonly and individually referred to as converting machines, process machines, production machines, or manipulating machines. Such machines operate either semiautomatically or fully-automatically, and perform a single operation or several operations. As a rule, they are built as single units or as a comparatively small series of units.

In considering a machine for any given purpose, it is necessary to determine whether it must be of special design or whether it can be obtained from some equipment manufacturer or supplier. Whatever the decision, it is influenced by certain requirements and limitations factors.

The requirements factors usually encountered are: production capacity, quality of product, adaptability of production, accuracy of function, and effectiveness of design. The common limitations are: cost (direct and indirect), size (physical) and power consumption, anticipated maintenance, safety hazards, noise level and frequency, portability (optional), patent situation, and, temporarily at least, procurement priorities.

If suitable equipment can be purchased within a reasonable time from some vendor, the problem is simplified or virtually solved. If this procedure is not possible for one reason or another, the necessity of designing and building the desired equipment is apparent. In this latter case, it is well to keep in mind that there probably are several ways to do the job and that the best over-all solution is reached by proceeding in some systematic manner. Here is a suggestive procedure:

1) Collect suggestions from every individual concerned.

2) Eliminate pointless suggestions by conferences with authorities.

3) Prepare sketches of reasonable suggestions and proposals.

4) Have tentative layouts examined by authorities — again weighing requirements and limitations factors.

5) Select one definite proposition or combine good features of different propositions, or modify or extend requirements and/or limitations.

6) Elaborate drawings to extent required for estimating and/or shopwork, and make final decision.

To the above steps must be added: selection of a competent builder, adequate check up on progress of fabrication, and a thorough followup during installation and breaking-in.

Necessity of Rational Design

Good design is rational design. Among the prerequisites of a designer capable of such effort are:

1) An analytical turn of mind. (Necessary to insure unbiased approach to fresh problems.)

2. Familiarity with the applications of up-to-date tools. (The term "tools" embraces shop techniques, technology of materials, working knowledge of mathematical methods — occasionally including dimensional analysis, nomography, and calculus. A knowledge of physics and physical chemistry is sometimes useful.

3) Thorough acquaintance with international literature on the subject. (Mere knowledge of national literature is often inadequate.)

4) Sufficient personal independence to warrant professional activity.

There are numerous elements of design in the development of production machinery. Some of these elements are presented in Table I.

Process Materials and Processing

Paper products usually are made of continuous bands of material. Wherever feasible, a sheet is unreeled and passed through one machine or a succession of machines. Sheet thickness may range from about 0.001 to 0.01 in., while a roll of paper may weigh up to 5,000 lb.

The layers of the basic material may be faced on one or both sides with asphalt, emulsions, adhesives, and/or cloth, fish paper, metal foil, cellophane or other plastics. Abrasive papers are coated with adhesive and flint, corundum or similar materials. A tabu-

TABLE I—Some Elements of Production Machinery Design

Item	Purpose			
	Storage	Transmission	Conversion	Control
Process materials	Stacks, reels Hoppers Funnels Tanks Containers	Conveyors Ducts Chutes Piping	Cutters Punches Presses Rolls etc.	Feeders Selectors Proportioners Balances Pickers
Mechanical energy	Weights Springs Flywheels Pendulum	Shafting Chains Belts Rods	Cams Linkages	Levers Catches Couplings, intermittent or continuous
Mechanical piloting means	Program disks Records Sound records Punched blanks	Leverages Wiring Beams of rays	Followers Feelers Gears	Auxiliary devices, as relays
Hydraulic or pneumatic energy	Reservoirs Air chambers	Piping Jets	Reciprocating or rotary pistons Rotors	Valves Throttles Orifices
Electrical energy	Storage batteries Condensers Solenoids Magnets	Wiring Electronic beams Induction balance	Transformers Rectifiers	Switches Cut-offs Rheostats Resistors
Heat	Boilers Accumulators Heaters	Liquid or gaseous carriers Infrared rays	Heat exchangers Direct contact	Valves Switches Dampers
Optical	Fluorescent or phosphorescent substances	Beams of light	Polarizers Frequency transformers Direction transformers, prisms, etc.	Obturators Shutters Stroboscopic disks, etc.

lation of some typical paper converting operations is presented in Table II.

Animal glue stabilized with phenol or other antiseptics and vegetable glue in the form of starch or dextrine are commonly used as bonding agents. They improve the strength of the texture and reduce its capillarity.

Among the commonly used impregnating agents are latex, cellulose ethers, paraffins and waxes. These materials may serve as fillers to close the pores, or/and improve resistance to moisture and certain chemicals. The stretching properties of the fibers may be improved by impregnation with certain glycols; other chemicals may be used to render materials vermin-proof.

Protein types of water paint frequently are employed in decorating, in other words, in the application of printed designs or patterns by etched rolls. Application of surface sizings or lacquers may be made to reduce penetration or to improve the gloss of printing inks.

In flaring or cupping operations, as in the manufacture of insulating parts for the electrical industries, the sheet material may be moistened as an aid to the flow of fibers. Conversely, heat is applied to accelerate the setting of previously humidified shapes, to provide cleaner edges in shearing, or simply to remove excess moisture or organic solvents by evaporation.

Other possible means for removing excess liquid include pressing, wiping, scraping, refrigeration and absorption. Brine-cooled refrigerating elements, for example, are employed in the manufacture of photographic papers after application of the emulsion.

Thus, depending on composition, moisture content, thickness and treatment, the finished product may be soft to semiplastic. However, in most cases, the structural characteristics of the original sheet material are changed only to a moderate and well-defined extent in any given production unit.

Developing Machinery Details

Most converting machines, particularly printing, labeling and packaging units, require the co-ordination of a considerable number of individual motions into a specific schedule. Generally speaking, these individual motions can be materialized either by means of cams or by means of linkages, and can be controlled by various piloting devices. Such elements may be operated mechanically from one driving shaft or from several driving shafts. In this latter case, the shafts may be arranged in parallel or at right angles. Means for operating such elements would include individual pneumatically-operated pressure cylinders, and individual electric motors.

TABLE II—Typical Paper Converting Operations

Mechanical shaping and joining
- Slitting, cutting, shearing
- Special cutouts: Windows, etc.
- Pressing, punching, indenting, grooving, scoring
- Calendering (Smoothing)
- Folding, creping, embossing
- Flaring, cupping, doming
- Sewing
- Reinforcing

Surface treatment
- Spraying
- Brush-coating
- Roller-coating
- Printing (Decorating, etc.)
- Wiping, scraping

Impregnating
- Humidifying
- Saturating

Heating and cooling
- Drying (by vaporization of liquid, or refrigeration)
- Baking of finishes

Packaging and auxiliary operations
- Pasting, labelling, tipping-on
- Combining, mounting, lining
- Winding, wrapping, banding
- Assembling, weighing, counting

Since the reliability of any mechanism depends on its weakest part, elements subject to appreciable stresses must be designed for best distribution of such stresses—eliminating their concentration.

Any joint in a moving part increases its weight and inertia. Therefore, the number of joints and intensity of fluctuation of torque and couple are reduced as far as possible. In certain instances, the range of harmonic vibrations must be watched to avoid rupture. As a general thing, best endurance per unit weight is desirable in moving parts.

Limitations in Design

Structural and operational safety, low maintenance, and moderate energy consumption are generally desirable. In other respects, requirements may be contradictory. The physical characteristics—shape, weight, and flexibility, and other properties of the items run—determine the dimensions of elements and their arrangement. Where adaptation to variations in such properties is demanded, the machinery is likely to become expensive in first cost, and the risk of over-design increases.

Plant layout and production flow variations also have to be taken into account as do maximum and minimum production rates. The operating speed of the entire line is controlled by the slowest operation. Adaptation to the space allotted and portability of machine units sometimes is required.

For convenience and economy, certain auxiliaries and "outside" elements are rarely designed for a given setup; rather they are taken from standard lines of specialized manufacturers. Such items include motors, speed reducers, transmission parts, counters, meters, certain controllers, electrical and electronic accessories, lubricators, and piping and fittings for gas, vacuum, air, oil, and water.

Selection of Construction Materials

Many liquids employed in coating paper products contain water as a solvent or thinner. Moreover, certain glues, for instance, may be slightly acid. Conditions of this kind eliminate the use of carbon steel for some purposes. Stainless steel, bronze, brass, aluminum, Monel, nickel, rubber, plastics, wood, or ceramics may be used in place of it. Aluminum in particular has the advantage in that its salts are colorless, hence, cannot cause specks or spots in paper.

TABLE III—Cams vs. Linkages

	Cams	Linkages
Applicability	Can provide most movements required	Require large number of bearings for more complicated movements. Better suited for high speeds than corresponding cams
Design	Comparatively simple	Comparatively intricate
Fabrication	Requires considerable skill in reproduction of theoretically best outline	Comparatively simple
Adjustability	Practically nil	Possible within wide ranges
First cost	Comparatively high, particularly for two-edge cams	Reasonable
Weight	Higher than for corresponding linkage	
Power required	Torque variable for single-edge cams which involve use of springs	Torque virtually constant
Influence of wear	Affects maximum acceleration period first. Positive-motion cams particularly likely to wear out	Subject to loss of accuracy due to clearance in bearings

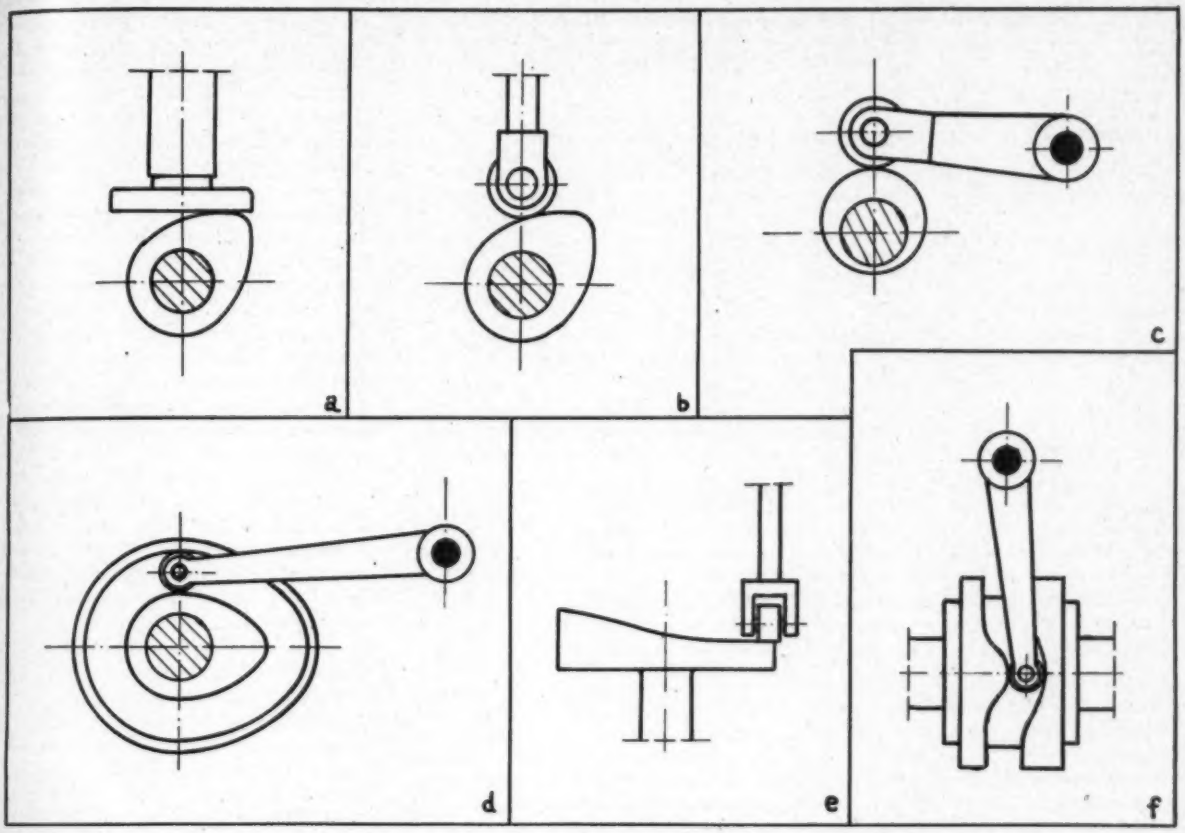

Fig. 1—Typical cam designs. Single-edge cam with (a) flat face follower; (b) roll follower; (c) swinging follower; (d) two-edge (positive motion) plate cam with swinging follower; (e) single-edge cylindrical cam; (f) two-edge cylindrical cam.

In members undergoing high-speed reciprocating motion, or operating with frequent starts and stops, light materials reduce inertia and provide a better dynamic balance.

The durability of parts subjected to much wear can be improved by heat treatment. Steel parts can be protected against rust or chemical attack by galvanizing, cadmium plating, rubber coating, painting, or other similar means.

Rolls and gears are often made of laminated thermosetting plastics, which are cured by heat and pressure. Their elasticity allows for slight errors in cutting, etc. Low moisture absorption insures stability of dimension. Further desirable properties are high mechanical strength and a low coefficient of thermal expansion. Some plastics are specifically lighter than aluminum and more inert to corroding agents.

Quietness of operation is obtained through the use of plastic, rawhide or laminated steel gears and of rubber blocks and pads. Natural or synthetic rubber belts and occasionally textile webs of canvas, wax-treated fabric or balata are used for conveying operations which are carried out at ordinary temperatures. Wire belts are available for similar operations at higher temperatures.

Power Transmission

Power may be transmitted mechanically by shafting, by endless chains or belts and by rods, levers, or gears. In the case of short shafts, it is desirable to reduce diameters as far as possible to minimize friction. Steel bar stock of high resistance to bending, with a dense, hard surface is preferable. Normally, carbon steel suffices. Where impact is considerable, nickel steel is useful.

A unit system of shaft diameters simplifies fabrication. In such a system, a shaft has the same diameter at all points. Thus the same tolerances affect all bearing and hub diameters.

A good connection between shaft and the individual hub is essential. Keys are sufficient in most cases, but where impact occurs, hubs should be pressed or shrunk on to shafts. The importance of accurate alignment of shafts increases with an increase in revolving speed.

If couplings are used, they should be designed for the safe transmission

TABLE IV—Steps in Rational Design of Production Machinery

1. Break up process into movements required for individual operations. Plot velocity and acceleration curves; if necessary, correct outline to fill practical requirements.
2. Compare available cam or link mechanisms with a view to possible application. Review characteristics and limitations. Select type best suited for operations considered.
3. Determine suitable materials and working dimensions of members of mechanisms for loads given, taking best advantage of characteristics of such elements.
4. Check up on pressures, accelerations, mass forces. Reduce critical values to safe figures. Consider other requirements of each individual operation: Adjustability, flexibility, quietness, durability of parts.
5. Co-ordinate and combine elements to yield satisfactory set-up as to space requirements (particularly good utilization of floor space), operating safety, accessibility, appearance. Lay out frame structure and covering. Assemble control elements at central location. Incorporate auxiliary and safety devices.
6. Consider method of fabrication: Use of standard parts, interchangeability of members; precision and tolerances involved. Device on use of built-up and welded, and/or integrally cast parts; pressed or die-cast elements for small items required in larger numbers.

TABLE V—Devices for Transferring and Distributing Materials

Nature of material	Typical devices
Solids	
Continuous sheets	Draw rolls
Stacks	Chain trolleys, platform trucks
Flat cuttings	Horizontal movement: Belts, flap carriers Vertical or varied: Vacuum cups, propellers Inclined: Air tables (over short distance)
Stamped or folded parts	Horizontal movement: Belts, flap carriers Vertical or varied: Mechanical pickers, wheel conveyors
Material in bulk	Screw conveyors, bucket carriers, vibrators Chutes, spouts, pneumatic (pressure or suction) systems
Liquids	
High viscosity	Steam-jacketed piping, belt applicators
Moderate viscosities	Stationary or vibrating spreader brushes, pneumatically or mechanically operated Rubber plug daubers Spreader strips Applicator rolls or wheels fitted with rims of compressible material (Rubber, felt, brush) Pin applicators
Low viscosity	Sprays, sponges, applicator rolls
Gases	
Air below atmospheric pressure	Piping or flexible tubing, cylinders
Air above atmospheric pressure	Stationary or oscillating cylinders Piping, tubing, jets
Other gases	Piping, stationary or flexible tubing

of both the largest torque and the greatest bending moment. Expansion joints in couplings isolate axial forces while transmitting the torque. Where permanent accuracy of alignment cannot be warranted, flexible couplings must be used.

Clutches permit the temporary disconnecting of shaft ends. Several types, including the friction, electromagnetic and fluid-drive types, are in use.

Copper oxide rectifiers, mercury arc units, as well as motor generator sets and synchronous converters are used for power conversion. The equipment used depends on the magnitude of the energy requirements.

Belts because of a certain amount of slip, do not provide a rigid interrelation between shaft movements. This characteristic is sometimes desirable. It may prevent overloads and breakage of parts caused by jamming.

Double angle rubber belts as well as flat belts and round belts can drive several pulleys from a common driver shaft. Stretching of belts is more noticeable on slow running drives than it is on fast running drives. A moderate amount of belt dressing improves the adhesion of leather belts. Generally speaking, belts should have good elasticity, should be low in weight, and should be insensitive to ordinary variations in temperature and humidity. V-belts are always preferable for short drives. Where possible, belt speeds should not be less than about 30 ft./sec. The steel belt, when running over surfaces of adequate tension, offers an excellent means of transmitting power.

Tensioning devices should be provided for all endless traction agents unless such agents are very short. Devices may consist of a shaft center adjustment arrangement, or of an adjustable idler. The adjustable idler is particularly suitable for long center distances.

Leather belts should be shortened if stretching becomes excessive.

Undesirable deformation of leather belts, such as stretching, buckling or warping, can be prevented by the use of composite materials made of two layers of thin leather glued to a flexible plastic strip.

Chains must be replaced if their elongation exceeds three per cent. The advantage of the chain drive, however, is that it maintains a virtually rigid interrelation between the driving and the driven shaft.

Levers and Gearing

While levers usually serve to transform a uniform velocity into a non-uniform one, gears are developed from a succession of levers which maintain a relative uniformity of motion. They serve to transform the speed with which shafts operate. Spur gears are used for parallel shafts, and bevel gears for intersecting or non-intersecting shafts other than parallel.

The quietness of operation of any gear drive depends upon the absence of cutting errors and the sound effect of the gear material. Cutting errors, if not too great, can be corrected by running-in if the number of teeth of the large gear is a multiple of the small gear and if the material of the small gear is harder than the large gear. The sound effect of the metal is dampened by the use of a rawhide, plastic or laminated gear combined with adequate lubrication.

For circumferential velocities up to 10 ft./sec., straight gears of carbon steel or chrome nickel steel will serve, particularly if running in an oil bath. Helical gars of chrom nickel steel with oil jet lubrication are employed for speeds of 30-100 ft./sec.

Each gear should be arranged next to a bearing to reduce the bending moment on the shaft. In the case of small gears, each gear should be supported with an outboard bearing. Such a support is not necessary for larger gears since the shaft diameter is correspondingly larger.

Worm gears permit speed ratios of 1:20 to 1:40. They are compact and silent, but comparatively expensive.

Wherever possible, gearing should be protected against dust, a sheet metal or cast iron casing being employed for the purpose.

Cams and Linkages

Cams (Figure 1) in paper converting machines commonly turn at constant speed. Usually they are of the single edge type with a spring insuring continuous contact of cam and follower. Cam charts make it possible to check on operating conditions. The acceleration curve together with the spring pressure controls the stresses occuring in the mechanism.

Springs can be avoided by means of a controlled linkage, such as positive motion cams. In any form of cams, the acceleration and deceleration of the follower can limit the cam speed. In the slow-lift period, the maximum end velocity is customarily about 1 ft./sec. Top accelerations may go up to 4,500 ft./sec. or more.

Table III shows relative merits of cams and linkages; while Table IV indicates the general sequence of steps in design.

Moving and Proportioning

Table V reviews the principal types of materials handling devices.

Blank material in the form of an endless web is usually handled by draw rolls. The rate of feed may be either uniform or non-uniform. A uniform rate of feed at the start may be varied periodically or reduced to temporary dead stops at certain points, and accelerated or decelerated back to its initial value at the delivery end of the machine. Such an intermittent starting and stopping motion may be achieved by segment rolls or other means.

EDITOR'S NOTE: This article is in two parts. Part II will appear in a subsequent issue of this magazine.

Beater Sizing *with* Starch

JAMES P. CASEY
A. E. Staley Mfg. Company

▸▸▸ STARCH HAS BEEN EMPLOYED for many years as a beater size in the paper industry. It has proved useful and economical in many grades of paper ranging from papers containing 100 per cent rag to cheap grades of board made from 100 per cent waste papers. Despite this general acceptance of starch as a valuable part of the beater furnish, the principles underlying its usage are not well understood. This lack of understanding has led in many cases to misuse of starch in the beater either through the use of an improper starch or the use of an otherwise proper starch under unfavorable conditions. This article is offered as a contribution to the better understanding of starch usage in the beater.

In a previous paper (*1*), the author stressed the importance in industrial applications of thoroughly dispersing starch in water. For best results most paper mill applications require the use of highly dispersed, colloidal solutions of starch, but beater sizing is one application where this principle has not always been applied. Some chemists believe that "swollen" starch gives better results in the beater than starch which has been thoroughly cooked and dispersed, although the opposite view is held by many others. A new approach to the subject, presented in this article, indicates that either theory may be correct, depending on the characteristics of the paper in which the starch is used. Experimental evidence is offered which shows that the relative efficiencies of "swollen" starch and highly dispersed starch depend on the physical structure of the paper to which the starch has been added. While this evidence has yet to be conclusively proved in commercial grades of paper, it does show promise as a means of evaluating starch where heretofore there has been no satisfactory criterion.

Before taking up the preceding subject in more detail, it is worthwhile to review some of the past work. This will be reviewed by dividing the subject matter into three sections: 1. a review of the chemical and structural properties of paper; 2. a review of the chemical and physical properties of starch dispersions; 3. a review of the function of starch in paper.

Review

Chemical and structural properties of paper. Since the earliest history of papermaking it has been recognized that a certain mechanical treatment of the cellulose fibers is necessary to obtain paper of good formation and high strength. The Hollander type beater was developed in the 17th century and since that time operators of this beater have learned the technique of handling to produce papers of different types. Two distinctly different effects can be produced in this beater. One effect is the cutting of the fibers to the correct length for good, even formation. The second important effect, called fibrillation, entails a bruising and splitting of the fibers into units of smaller structure, the fibrils. This fibrillation is of the greatest importance in the development of maximum sheet strength. The development of fine fibrils on the fiber surface makes the contracting forces more effective during the drying operation; at the same time the increase in fiber flexibility makes the fiber more responsive to these forces. These factors have a pronounced effect on the density and other structural properties of the sheet and, in fact, as has been shown by Clark (*2*), the apparent density of test sheets is accurately linearly proportional to the logarithm of the amount of beating over most of the beating range.

The apparent density of a sheet of paper is perhaps the most important fundamental factor influencing paper quality (*2*). Many (*3, 4, 5*) have noted that tensile strength and burst of a sheet are proportional to the density. In fact, Doughty (*6*) has shown that tests sheets having the same density will have equal strength regardless of the amount of beating. This is true for sheets of the same density made from lightly or heavily beaten pulp where equal densities are obtained by variation in the amount of wet pressing. The increase in density obtained by calendering of a relatively dry sheet has only a minor effect on strength properties.

The increased strength at higher sheet densities is undoubtedly due to an increase in the number of contacts between fibers. All degrees of bonding between the fibers may be found . . . from relatively little bonding in blotting paper, to a very high degree of bonding in glassine paper. Naturally the percentage of air space in such papers differs enormously. Lee (*7*) in his structural studies of paper has presented an interesting set of photographs showing the difference in volume of air space between an all rag filter paper and an all rag, hard beaten and pressed paper. Cross sections of these papers show large air pockets in the filter paper while the hard beaten paper shows almost no visible air space at the magnification used.

The preceding observations make it clear that the most important fundamental property of a sheet of paper, aside from the length of its component fibers, is the apparent sheet density, or in other words, the amount of fiber contact. A study of the structural properties of different grades of paper shows an enormous difference in the amount of fiber contact.

Chemical and structural properties of starch dispersions. The granules of most starches are composed of two diversely constituted chemical elements, amylose and amylopectin, which differ greatly in their physical and chemical properties. Amylose is readily soluble in hot water, but spontaneously precipitates from relatively dilute solutions upon standing. Amylopectin is difficultly soluble, but once dissolved forms a stable, colloidal solution. Raw starch granules of ordinary corn starch contain about 30 per cent amylose and 70 per cent amylopectin.

The structural properties of a starch

AUTHOR'S NOTE: *This article is a sequel to one entitled "Starch Dispersions for Paper Mill Use," published in the May, 1944, issue of THE PAPER INDUSTRY AND PAPER WORLD. A section of the first article was devoted to discussion of the relative merits of poorly dispersed starch and highly dispersed starch solutions for beater sizing. This article discusses the subject in more detail and presents a new approach based on an analysis of the structural properties of the paper in which the starch is used.*

dispersion depend on the type of starch and the method of gelatinization. In the gelatinization process, the starch granule swells to many times its normal size and some of the starch goes into solution. A boiled suspension of unmodified corn starch contains two diverse elements, soluble starch and swollen, but undispersed, granules. The relative proportions of these elements depends on the severity of the cooking operation.

A suspension of corn starch boiled for several hours ordinarily contains about 40 per cent soluble starch and 60 per cent swollen starch granules. The soluble starch represents about 80 per cent of the original amylose whereas about 80 per cent of the original amylopectin remains in the swollen starch granule.

Most starch dispersions contain these swollen granules or fragments of granules which are clearly visible under a microscope. These swollen starch granules can be disrupted and made into a fine dispersion by autoclaving at high pressures or mechanical means such as homogenization or milling in a colloidal mill. A few types of starch, notably the oxidized starches, produce a nearly homogeneous solution of finely dispersed starch with ordinary cooking procedure. This has been shown (*1*) in photomicrographs.

The importance of these undispersed granules is not generally recognized probably due to an erroneous belief that they represent only a small percentage of the original starch, although in some cases these swollen granules represent up to 70 per cent by weight of the original starch. This paper offers evidence to support the belief that the physical state of the particles in a starch dispersion has a profound effect on the results in beater sizing.

Function of starch in paper. Beater starch is used in different grades of paper for one or all of the following reasons—to increase burst, tensile or fold test; to increase stiffness; to increase the rattle; to improve sizing; to lay surface fuzz and improve the finish. The manner in which the starch performs these various functions has been widely discussed, and the generally accepted theory is that starch coats the individual fibers with a gelatinous film which increases the strength of the fiber-to-fiber bond.

Although cellulose is endowed with a strong surface activity, starch is apparently not adsorbed to any extent by plain cellulose fibers. An increase in fiber surface through beating or an increase in the amount of starch employed in the beater does not help materially in starch retention (*8*). This is due to the fact that both wet cellulose and starch are negatively charged colloids and repel each other. Such work has led Strasser (*9*) to the conclusion that starch is never adsorbed by the fiber but that it adheres to the fiber by mechanical means. Rowland (*10*) has felt that cellulose fibers can be made to adsorb starch under conditions where either the starch particle or the fiber surface has been given a positive charge by the fixation of alumina on its surface. Within recent years it has been reported by Pascu (*11*) that one of the fractions of corn starch, the amylose fraction, is very strongly adsorbed by cellulose fibers but that the amylopectin fraction is not adsorbed.

Drying of handmade test sheets containing starch added at the beater shows that there is a strong tendency for the soluble starch to rise to the surface of the sheet during the drying process. Counteracting this effect is whatever adsorptive powers the cellulose fibers in the interior of the sheet have for the starch. The effect in the finished paper is probably the resultant of these two forces, a slight concentration of soluble starch on the surface of the paper but some left in the interior of the sheet.

Whatever the mechanism of starch retention, it is sufficient to know that the individual particles of starch in the dispersion added at the beater are dried on the surface of the fiber when the water is evaporated on the dryers. Where these particles touch two adjacent fibers or fibrils a bond is formed through the fiber-to-starch-to-fiber bond.

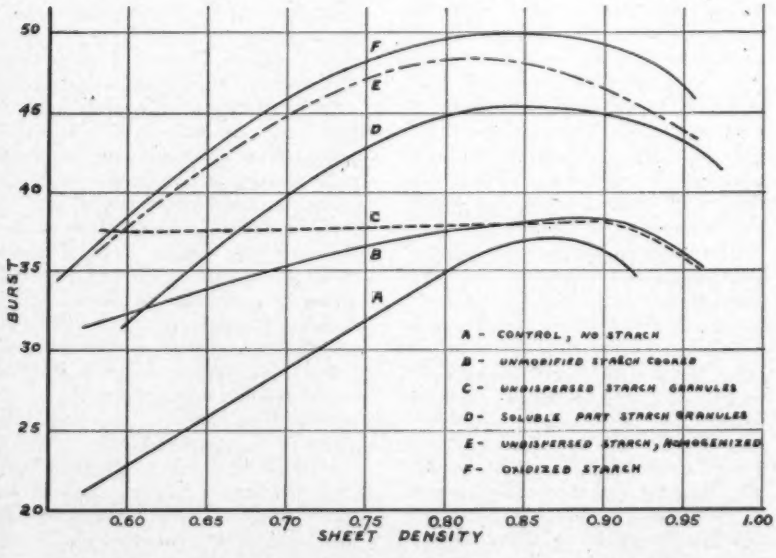

Fig. A—Comparison of three highly dispersed starch solutions (Curves D, E, and F) and two poorly dispersed starch suspensions (Curves B and C) in sheets of different densities. Sheets contain 2½ per cent starch.

New Approach to Beater Sizing

The preceding review of past work on the chemical and physical properties of starch and paper emphasize the following three points:

1. The amount of fiber contact in a sheet of paper is the most important factor determining the strength of the sheet. Different grades of paper differ enormously in the amount of fiber contact.

2. An important property of starch dispersions is the physical state of the starch particles making up the dispersion. Most dispersions of native corn starch contain a high percentage of large, swollen starch granules. A few dispersions of modified starch are composed of highly dispersed, colloidal starch.

3. The chief function of starch in paper is to increase the fiber-to-fiber bond by acting as a cementing agent between adjacent fibers at their points of contact.

The preceding points can be used to form a mental picture of what takes place when starch dispersions of different particle size are added to a system of papermaking fibers.

A dispersion in which the starch exists as highly dispersed colloidal material contains an enormous number of individual starch particles, enough to completely cover the fiber surface in a sheet of paper even at relatively low concentrations of starch. In starch dispersions of coarse particle size, such as those containing only swollen starch

granules, the individual particles are relatively few in number and are not enough to completely cover the fiber surface. However, the amount of fiber surface covered with starch does not in itself affect the strength of the paper since the starch can function as an adhesive only where it contacts simultaneously two contiguous fibers. In a sheet of low density, where the area of fiber contact is small, there is no advantage in having the entire fiber surface covered with starch particles since these starch particles will not contact another fiber except at infrequent intervals along the length of the fiber. In such a sheet, a highly dispersed starch would be of no advantage in increasing the fiber-to-fiber bond since most of the adhesive starch particles are wasted by coating fiber surface which does not contact a second fiber. In such a low density sheet highly dispersed starch might be less effective than a suspension of large swollen starch granules, which are conceivably large enough to form a bridge between two fibers separated by an appreciable air space. In sheets of high density the reverse should be true. Since adjacent fibers are in contact over more of their area, it is desirable to have most of the fiber surface covered with starch to increase the strength of the bond. Here a majority of the particles in the highly dispersed starch solution would be utilized due to the large area of fiber contact. On the other hand, a dispersion of large swollen granules would provide only occasional contact and, although highly compressible, might tend, by means of their large size, to hold the fibers apart.

The above ideas can be presented succinctly by the two propositions: (1) highly dispersed starch solutions are most effective in high density sheets and least effective in low density sheets; (2) poorly dispersed starch suspensions which are composed predominately of swollen starch granules are most effective in low density sheets and least effective in high density sheets. These ideas have been verified by the experimental work described below.

Samples from the same lot of bleached sulphite pulp were beaten in a laboratory beater for different lengths of time to obtain a series of pulps for preparing sheets of different densities. Six samples of pulps were made with beating times ranging from 2 to 96 hours. The densities of sheets made from these pulps ranged from 0.550 to 0.980. In making test sheets from these pulps, 2 per cent dry rosin size, 8 per cent alum, and 2½ per cent starch was used in each case, except in the control where no starch was used. Five dispersions of starch were used representing different types of starch dispersions. These were as follows:

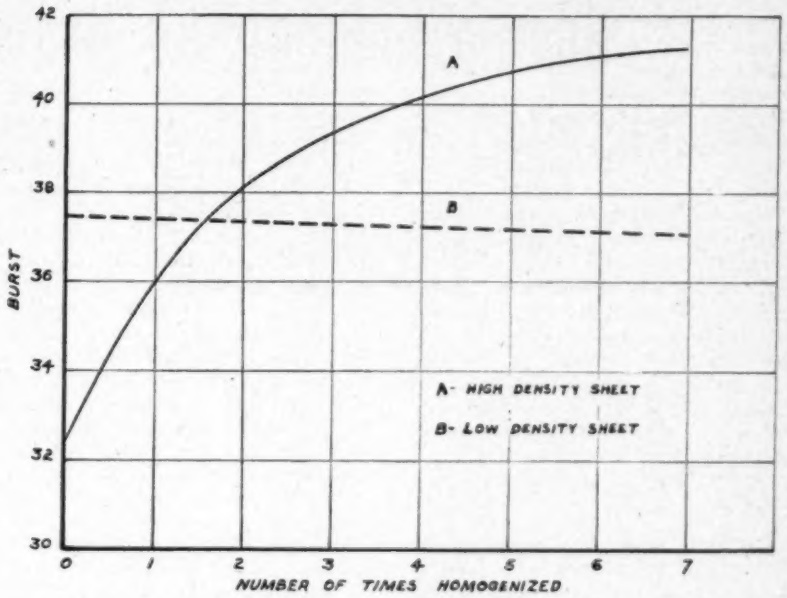

Fig. B—Effect of mechanical dispersion by homogenization on a suspension of "swollen" starch granules (free of soluble starch) when used in a high density and a low density sheet. Sheets contain 2½ per cent starch.

B. *Unmodified corn starch* cooked at 210 F. for one hour. This had about 35 per cent soluble starch and 65 per cent undispersed starch granules.

C. *Undispersed starch granules* removed from a cooked dispersion of unmodified corn starch by settling and washing to remove most of the soluble starch.

D. *Soluble starch* taken from a cooked dispersion of unmodified corn starch by removing the undispersed granules in a centrifuge.

E. *Undispersed starch granules* homogenized six times in a hand homogenizer to break up the granule structure to give a fine dispersion of starch.

F. *Oxidized starch* cooked one hour at 210 Fahr. to give a highly dispersed starch solution.

The above starches were used in the correct amount to give 2½ per cent starch on the weight of the pulp. Sheets were made on a laboratory sheet machine, pressed in the usual manner, and air dried at room temperature to prevent any further change in the structure of the starch in the sheet. Burst tests were made to determine the strength of the test sheets and the results shown by the following curves, Figure A.

Another set of experiments was conducted in the following manner:

A sample of lightly beaten stock and of hard beaten stock were prepared from the same lot of bleached sulphite pulp. In the preparation of sheets from these two stocks, 2 per cent rosin, 8 per cent alum, and 2½ per cent starch was used. The starch was prepared as follows:

A suspension of swollen starch granules free from soluble starch was prepared by heating unmodified corn starch for one hour at 210 F. and then removing the swollen granules by repeated centrifuging and washing. The correct amount of these swollen starch granules to give 2½ per cent starch on the pulp was added to both of the above pulps. Other portions of this swollen starch were homogenized a different number of times in a hand homogenizer to break up the granule structure. Samples were put through the homogenizer 1, 2, 4, and 7 times and each of the homogenized dispersions added to the above two pulps. Sheets were made from all samples and air dried. Burst tests were made to determine the strength of the test sheets and the results shown on the curves in Figure B.

Figure A shows that the highly dispersed starches represented by Curves D, E, and F, are much more effective in sheets of high density than the coarsely dispersed starches represented by Curves B and C. The effectiveness is indicated by the difference between the curves representing tests with starch and the control Curve A. Curve B represents an unmodified corn starch dispersion cooked for one hour, which

contains about 35 per cent soluble starch and 65 per cent swollen starch granules. Curve C represents almost 100 per cent swollen starch granules but does contain a small amount of soluble starch due to limited washing. If this sample had been washed entirely free of soluble starch, a further drop in effectiveness would be obtained in sheets of high density.

Highly dispersed oxidized starch (Curve F) and swollen starch granules which have been highly dispersed by mechanical means (Curve E) apparently have a greater intrinsic adhesive strength than the portion of the starch granule which is readily soluble in hot water. Since these swollen starch granules are mostly amylopectin, the results indicate that amylopectin has a greater intrinsic adhesive strength than amylose, which is represented by the soluble starch (65 per cent amylose).

Figure B is a further proof of the above theory. The swollen starch granules from a cooked starch suspension are more effective in a sheet of low density than a sheet of high density. As these granules are broken mechanically into units of smaller particle size, their effectiveness decreases slightly in a sheet of low density. However, in a sheet of high density, where the area of fiber contact is larger, there is a tremendous increase in effectiveness as the particle size is decreased by the mechanical process of homogenization.

Summary

The preceding theory and experimental results explain why highly dispersed starches such as the oxidized starches are most effective in sheets where there is a large area of fiber contact. In a previous paper (*12*) the author showed that oxidized starches must be used in fairly high percentage in the beater to obtain effective results. Enough oxidized starch or other highly dispersed starch solution must be added to insure adequate fiber coverage. Commercially this seems to be at least 2½ to 3 per cent starch based on the weight of the fiber.

Starch dispersions containing swollen starch granules or granule fragments are proportionately more effective in sheets of low density where the fiber contact is less; and there is a range in commercial grades of low density papers where this type of starch is the better choice. Such unmodified starches are usually cheaper than special modified starch and are a better choice when results equal to or better than those with a highly dispersed starch are obtained. This condition is usually found when low percentages of starch, 1 to 2½ per cent on the fiber, are used in sheets of fairly low density.

Starch can be used with effective results in the beater and the ultimate test is the effect the starch has on the physical qualities of the paper. In the past, paper mill chemists have placed undue emphasis on the cost of the starch and the amount retained in the sheet. More important factors are the selection of the proper type of starch and its use under conditions that insure proper distribution in the sheet; and proper distribution should be construed in relation to the structural properties of the sheet. Beater sizing with starch will be very profitable in many grades of paper if the proper choice and the proper use of the starch is made.

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Wet-Strength Paper for War Maps

An account of the development of the paper for improved war maps, and its manufacture in quantities necessary to meet unprecedented requirements, is a story of accomplishment through co-operative effort. The new paper, which is responsible for the remarkable performance of the maps under all conditions of current combat service, was developed by the Army Map Service in co-operation with the National Bureau of Standards and with the wholehearted assistance of certain paper manufacturers.

The new paper has greater strength than any previously used for maps, and retains this strength after being soaked with water or oil, or after being trampled in the mud, and subsequently washed with soap and water, or dipped in gasoline. Even when soaking wet, the paper has satisfactory writing and erasing characteristics. In addition, it has good printing properties and meets all the usual requirements of map paper.

The Bureau has had an important role in extending the commercial manufacture of this paper to widely distributed mills and in utilizing different types of raw materials so as to increase production and to meet the rapidly expanding needs of the Armed Forces. Two difficult problems were involved: (1) It was necessary to bring into production an entirely new type of paper in mills not familiar with its manufacture, and (2) the supply of the special pulp used in this paper as originally developed became extremely short, and it was necessary to employ pulps previously untried for the purpose.

These problems were solved on a production basis by sending an expert from the Bureau to the different mills selected by the Army to receive educational orders. Charles G. Weber, who had been closely identified with all phases of the development and testing work, served as a technical consultant to 11 different mills and worked with the staff of each until a paper meeting all the requirements of the specification was obtained.

The map paper is now being produced in mills distributed from coast to coast and from the Gulf of Mexico to the Canadian border. Moreover, pulps from eastern spruce, southern pine, western hemlock, and the jack pine of the Great Lakes region are used with equal success. The current requirement is well over 10,000,000 pounds per month, and this huge tonnage is being supplied without departure from the original high standard of quality.

An Improved Method for the Large-Scale Laboratory Preparation of Holocellulose[1]

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HOLOCELLULOSE, as it has been defined in recent years, consists of the entire carbohydrate fraction of the plant cell wall, after removal of lignin and the extractive components. It is not, however, a homogeneous substance, but includes the true cellulose together with hemicelluloses of various kinds. A certain portion of these hemicelluloses is retained by practically all wood and straw pulps, and they play a role in determining various pulp qualities. Inasmuch as holocellulose includes these hemicelluloses, it furnishes the logical raw material for their further study. Some of these hemicelluloses are originally present in combination with the lignin of the wood, and tend to become easily soluble in water when the lignin is removed. The isolation of holocellulose, therefore, requires a method by which this solubility is reduced to a minimum. The application of some form of active chlorine and an alkaline extracting agent has generally been the most successful means of removing the lignin with the least effect on the cellulose and hemicelluloses of the wood.

Three general methods of preparing holocellulose (or its equivalent, "skeletal substance,") have been developed. The first depended in part on the work of Cross and Bevan (*1*), who used alternate treatments with chlorine gas and boiling sodium sulphite solution. These authors, however, were concerned with the cellulose rather than with the total polysaccharide of the wood. The aqueous washings removed not only the chlorinated lignin, but also a portion of the polysaccharides, and some degradation of the cellulose was produced by the chlorination. In attempts to reduce the loss of carbohydrate and the degradation, numerous variations of the Cross and Bevan technique were devised (*2, 4*). None, however, were particularly successful at reducing the loss of the more soluble carbohydrates until Ritter and Kurth (*5*), in 1932, replaced the aqueous solvents for the chlorinated lignin with an alcoholic solution of pyridine. After three alternate treatments with chlorine gas and this solvent, followed by a hypochlorite bleach, they obtained from extracted maplewood a residue which contained 97 per cent of the original furfural-yielding components. The yield of residue agreed well with the "theoretical" yield (100 per cent less the lignin by the sulphuric acid method). Because it appeared to represent the actual entire carbohydrate fraction of the cell wall, the product was named "holocellulose."

Improvements in the original Ritter and Kurth method were made by Van Beckum and Ritter (*6*), and their procedure has become widely adopted for the preparation of holocellulose. They introduced the use of a hot alcoholic solution of monoethanolamine for the removal of the chlorinated lignin. This solution gave a pronounced color reaction with any lignin remaining in the residue; it was thus possible to tell when the delignification had been completed.

The second method of preparation was that of Schmidt and Graumann (*7*), who employed alternately solu-

Apparatus for large-scale laboratory preparation of holocellulose.

(1) A portion of a thesis submitted in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Doctor of Philosophy from Lawrence College, Appleton, Wisconsin, March, 1944. This work was carried out under the direction of Louis E. Wise.

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TABLE I—Comparative Analyses of Extracted Holocellulose and Wood

	Ovendry Holocellulose		Ovendry Extracted Wood (per cent)
	On Basis of Sample (per cent)	On Basis of Extracted Wood (per cent)	
Yield	100.0	77.8	100.0
Lignin	0.4	0.3	18.9
Holocellulose, lignin-free	99.6	77.5	81.1*
Pentosan	24.1	18.8	20.2
Pentosan lost, based on total	.....	7.0	.....
Uronic acid, as CO_2	1.34	1.04	1.19
Acetyl	3.36	2.61	3.30
Methoxyl	0.88	0.68	5.41
Mannan	0.0	0.0	0.0
Galactan	0.0	0.0	0.0
Nitrogen	0.57	0.44	0.15
Ash	0.20	0.16	0.28
Water-solubles recovered	.....	1.41	.....

(*) Calculated

tions of chlorine dioxide and sodium sulphite. The latter was subsequently (*8*) replaced with a solution of pyridine, which appeared to minimize the loss of carbohydrate; this one-step process, however, required 17 to 26 days to complete delignification. The third method is based on the recent introduction of sodium chlorite as a mild bleaching agent and was applied to the preparation of holocellulose by Jayme (*9*), who reported complete recovery of the cell wall carbohydrates. Good results with this reagent have also been obtained by Wise (*10*).

The results of Van Beckum and Ritter and others have indicated that the holocellulose was obtained in "theoretical" yield as the total carbohydrate fraction of the cell wall, free from all lignin. In other words, in extracted wood, the lignin plus the holocellulose accounted for 100 per cent of the wood substance. However, Atchison's observation (*11*) that monoethanolamine forms an acid-soluble complex with lignin, and the known solubility in water of part of the polyuronide after removal of most of the lignin raised this question: Might not these "lignin-free" holocelluloses very possibly retain a small amount of lignin, undetectable by a lignin analysis, and yet, by losing a similar small amount of polyuronide, give an approximately theoretical yield by a fortuitous cancellation of the errors? In part, this question is answered by the following study.

The investigation was undertaken to attempt a further improvement in the preparation of holocellulose and, at the same time, to find means of preparing large quantities of the product. Of the three methods outlined above, the last two were rejected because they depended principally on aqueous treatments, which it was believed would dissolve portions of the polyuronide hemicelluloses. The method of Van Beckum and Ritter presented a different obstacle to the preparation of any large quantity of holocellulose. This was the degradation and the decreased yield which occurred, as found by Atchison (*11*), Jahn and Holmberg (*12*), and Hajny and Ritter (*13*). The degradation was apparently caused by the heat evolved in the chlorination reaction, which was localized and could not be conducted away from the interior of a large mass of wood meal and which, together with the hydrochloric acid liberated during the reaction, induced considerable loss of carbohydrate material. The aqueous washings required between treatments by the Van Beckum-Ritter procedure were also considered a possible source of error, through the loss of some polyuronide.

Both of these difficulties were in large measure overcome by carrying out the initial chlorinations of the wood meal in suspension in cold carbon tetrachloride and eliminating as far as possible the use of water; the delignification was then completed by the method of Van Beckum and Ritter.

Aspen wood was used for the work because it is an important pulpwood and because its lignin content is quite low; thus, it may be expected to give a better recovery of carbohydrates than is possible from a softwood. Simultaneously, because of its very high carbohydrate content, its use subjects any holocellulose method to a rigorous test. The aspen log came from Northern Michigan; it was about 35 years old when cut, and had been seasoned two years. It was cleaned, reduced to sawdust, and ground in the Wiley mill; the 40-80-mesh fraction was retained for the investigation. The wood meal was extracted successively with alcohol-benzene and cold water and dried in the air.

In a series of orientative experiments, the wood meal was chlorinated in suspension in carbon tetrachloride. The beaker containing this suspension was immersed in an ice bath, and the suspension was agitated constantly. Thus, a thorough mixing of the chlorine with the wood meal was obtained, and the heat produced by the chlorination was immediately removed. The chlorinated wood meal was rinsed onto a filter and treated with a hot alcoholic monoethanolamine solution, similar to that used by Van Beckum and Ritter. In one of these preliminary tests, several repeated treatments were carried out without the application of any water to the air-dried sample. However, it was found [as shown by previous investigators (*2*)] that some water was essential, provided the reaction was to proceed at a practical rate. It was found also that, after the greater part of the lignin had been removed, the heat developed by subsequent chlorinations was insignificant, and that the normal Van Beckum-Ritter procedure could be applied to large samples of wood meal.

The detailed method developed for the large-scale laboratory preparation of holocellulose was as follows: About 350 grams of extracted wood meal were placed in a ten-inch Büchner funnel fitted with a filter pad consisting of two layers of glass cloth fastened down by Bakelite cement, moistened, and the excess moisture drawn off by suction. The wood meal was then transferred to a four-liter beaker; the baker was nearly filled with carbon tetrachloride and set in an ice bath. When the mixture had cooled below about 5 C., chlorine gas was passed in, the inlet tube being used as an agitator to prevent local overheating and to mix the chlorine thoroughly with the wood meal. Chlorine addition was continued for 15 minutes, after which the wood meal was returned to the filter and the carbon tetrachloride drawn off. The funnel outlet was then closed with a cork and the wood meal mixed thoroughly with hot alcohol. After two minutes the cork was removed and the alcohol drawn off by suction. This washing was repeated, and the wood meal was then similarly treated three times by mixing with hot (75 C.) 3 per cent alcoholic monoethanolamine, soaking two minutes, and sucking dry. Three more extractions with cold alcohol were then employed to remove the remaining monoethanolamine solution. Finally, with suction applied continuously, about two liters of ice water were poured over the material and rapidly drawn through.

A second treatment (chlorination and washing) was then carried out in

the same manner. In the third treatment, the chlorine addition time was reduced to ten minutes, although the mixture was stirred for an additional five minutes, and only two extractions with hot monoethanolamine solution and two washings with cold alcohol were given. In the fourth treatment, the chlorine application time was further reduced to seven minutes, but the entire chlorination time remained 15 minutes. The water washings from all treatments (other than the first), were collected and saved for concentration and recovery of the carbohydrates which had been leached out.

The fifth and sixth treatments consisted of the normal Van Beckum-Ritter two- and three-minute gaseous chlorinations. The chlorine was applied through a second Büchner funnel inverted over the one containing the sample, as shown in the accompanying illustration. The washing sequence was the same as that used for the fourth treatment, the water wash being held to the minimum necessary to provide water for the chlorination reaction. Finally, a treatment was given which consisted of a short direct chlorination and washing with alcohol, ammoniacal alcohol, alcohol, and ether. The holocellulose was dried in the air.

In this procedure, the washings immediately after the first two chlorinations were made with hot alcohol to remove the carbon tetrachloride, chlorine, and hydrochloric acid more efficiently, and to preheat the wood meal for the following hot extractions. The time of chlorination was kept constant, but the chlorine application time was reduced for the third and fourth treatments because, as the lignin was removed, the chlorine consumption decreased. The smaller amount of chlorinated lignin to be removed also made it possible to reduce the number of extractions and washings in the later treatments. The first chlorinations imparted a bright orange color to the wood meal which, on application of the monoethanolamine solution, changed to a deep purple. At the end of the fourth treatment, this purple color had changed to a light brown and, at the end of the preparation, the last chlorination produced a pure white residue and the application of monoethanolamine induced a very faint cream color, which remained in the finished holocellulose. At the end of each treatment, other than the first, the water washings were collected. They were concentrated under reduced pressure, and a quantity of polysaccharide amounting to 1.5 per cent of the weight of the original wood was recovered by precipitation into alcohol. This was purified by solution in water, filtration, and reprecipitation into alcohol.

The short chlorination treatment used at the end of the preparation was intended to release, by acidification, the greater part of any monoethanolamine which might have been adsorbed by either the cellulose or traces of residual lignin. The finished holocellulose was found to retain most of the structure of the wood meal, indicating that the fibers had not entirely fallen apart. A similar result found by Jayme (*9*) was taken as evidence that the traces of lignin which are most difficult to remove perform an important structural function in the wood.

This method of preparing holocellulose is also adaptable to samples of analytical size. If an extraction crucible (Jena 1G1) of a volume more than twice that of the pad of wood meal is used, carbon tetrachloride may be added and the chlorination carried out in the crucible. The bottom is fitted with a stopper to prevent filtration while the crucible stands in the ice bath for chlorinating and while the wood meal is being soaked with the various extracting solutions.

Comparative analyses of the extracted aspen wood and the holocellulose prepared in this investigation were made by the respective methods of The Institute of Paper Chemistry. The data, based on a total of 670 grams of holocellulose prepared in three lots, are compiled in Table I. Table II shows the distribution of four important constituents of the wood, as found in the wood, and their recovery in the holocellulose and the water-soluble material recovered from the washing solutions.

The holocellulose as obtained showed only 0.4 per cent lignin, *but the nitrogen content, being about three times that of the wood, indicated that some monoethanolamine or ammonium salts were retained.* It was assumed that there was also some undetected lignin retained in combination with the holocellulose. Later work (to be reported in a second paper), in which the holocellulose was subjected to extraction with solvents of graded strengths, substantiated this assumption. The loss of some 7 per cent of the total pentosans is comparable with losses found by other investigators, but it should be noted that more than half of this loss was recovered in the material isolated from the wash waters used in preparing the holocellulose. Most of the uronic acid lost was also recovered in this fraction. It is evident, therefore, that even a minimum of water used in the preparation of holocellulose can cause a very appreciable loss of the more sensitive polyuronides. The water-soluble fraction was found to contain 33 per cent uronic acids and 44 per cent xylan. About 80 per cent of the acetyl groups of the wood was recovered, and about one-eighth of the methoxyl groups was found to be in the holocellulose.

In terms of the total wood substance, 97.8 per cent was accounted for, as follows: lignin, 18.9 per cent; water-solubles (recovered during the holocellulose isolation), 1.4 per cent; holocellulose ("lignin-free"), 77.5 per cent; total, 97.8 per cent. Three sources of probable error are not considered in this summation. Not all the "water-soluble" material initially removed was recovered (its presence was not discovered until a part of the first large preparation had been completed). Some of the wood meal was mechanically lost in handling, and some degraded lignin, not detected by analysis, was probably present in the holocellulose.

The preparations of aspen holocellulose outlined here were made on samples of 350 grams of wood meal and, altogether, about 900 grams of holocellulose were prepared. No difficulties are foreseen in applying the

TABLE II—Distribution and Recovery of Constituent Groups in Wood*

Component	Acetyl (per cent)	Methoxyl (per cent)	Carbon Dioxide† (per cent)	Xylan (per cent)
Holocellulose	2.63	0.69	1.04	15.8
Water-soluble fraction	0.02	0.01	0.11	0.7
Lignin	.....	3.99	.....	.....
Total	2.65	4.69	1.15	16.5
Present in original (extracted) wood	3.31	5.42	1.19	16.8
Percentage accounted for:	80	87	97	98

(*) Based on ash-free extracted wood.
(†) The values for carbon dioxide, multiplied by four, give the percentages of uronic anhydride.

method to still larger samples, if adequate provision is made for rapid filtration, and if the application of water is kept at a minimum, both in quantity and time. Considerable economy of solvents might be achieved by use of counter-current operations. The preparation of holocellulose for a study of its pulping properties, however, still presents another problem. The many chlorinations, extractions, and washings require rapid penetration of the particles of wood. Groundwood, unless specially prepared, would be too slow in filtering, and chips would probably not be delignified. Pulp prepared by the Asplund process has been converted to holocellulose (*13*) and a similar result was obtained with shavings (*14*). Depending on the completeness of recovery and the quality of holocellulose desired, these methods might be suitable, or it may be possible to use chips softened and crushed under heavy pressure.

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The Tests for Freeness

ARTHUR B. GREEN

▶▶▶ LOOKING DOWN FROM ABOVE the fourdrinier table when a new wire is installed, even the seasoned observer is impressed with its silken brightness. Let the wet end be started and the showers be turned on, and the wire remains bright. Not until the stock is run on does a factor come to bear that gradually dims the new wire, changing its color from that of polished bronze to some shade of darker brown, and taking away all of the shine. How fast this happens, and to what final shade the wire may tarnish, depend on the kind of stock.

A new wire makes a given stock behave freer than an old wire. As a new wire runs, this apparent freeness changes back to something like a norm for the run, the change being rapid at first, then proceeding at a declining rate. In fact, no time comes when a wire is constant with respect to the draining of water from a given stock, as the practical papermaker will sense from experience even though he realizes at the same time that the given stock itself, in nearly all mills, is no constant by which a wire can be specifically gauged. The operation of the paper mill is, with reference to freeness as with reference to other things, afloat on a sea of variables.

Testing by Imitation

With this in mind, what becomes of the idea, more prominent in the early days of freeness measurement than now, but still often voiced, that to test freeness it is necessary to use fourdrinier wire for the screen because the paper machine runs a woven wire? If the testing device is to employ a wire like the paper machine wire, then which mesh or weave shall it be like, and at what point in the life of the wire on the machine shall the wire in the testing device be stabilized? The two questions obviously have no answers. They would have no answers if the draining carried out by the testing device were anything like the draining that occurs through the paper machine wire. All the less do they admit of answer when the testing device starts out with a hydrostatic head over the screen of several inches, a dimension out of all proportion with the small fraction of an inch that stands usually on top of the fourdrinier wire, and besides, the testing device would be hard put to it to reproduce the fourdrinier shake, not to speak of the forward travel with its little bumps over the table rolls. No testing device for freeness has ever been imitative of the paper machine. All it can be is a more or less parallel, embodying as many constants as may be, and serving as an indirect and interpretive, rather than as an absolute, measurement.

Any parallel between a testing device and the paper machine operation, with respect to freeness, will be rough rather than precise, no matter how well standardized the testing device may have been when it was new. A given difference in freeness, as given by a tester, will correspond with numberless differences of freeness as they show up on the paper machine, just as a wire will change with use, just as paper machines run different stocks, just as the same stock may be run to a lighter or heavier sheet. But, if in general, the testing device gives results which vary in like direction with the variations showing up on the paper machine, then the device is a good thing with important uses. By means of its tests, the relatively free and the relatively slow stocks can be distinguished apart from the paper machine, and the direction of change brought about by mechanical or chemical treatment in advance of the paper machine may be seen. That furnishes the ability to specify and forecast the freeness characteristics prior to running out on the machine, a substantial step toward mill control.

Standardization

The early attempts to standardize the freeness test concerned themselves with the laboratory form of test. The plan was to standardize the flow properties of the screen and of the conical member used to separate the quick drainage from the slow. The standardizing procedure was hydraulic, actually passing water through the screen and through the conical funnel under defined conditions, and calling for the screen and the funnel to be so dimensioned that there would be specified rates of flow.

But the flow properties so specified depend not solely on the dimensioning of the parts of the tester. They are subject to important change by reason of the chemical condition of the surfaces. In order to standardize by means of the hydraulic method with any accuracy, some way has to be set up and faithfully followed for conditioning the surfaces chemically before the water is passed through. That is not quite so simple as it may sound, and it is a factor that cannot be checked afterward to make sure that the persons doing the standardizing attended to the chemical condition of the surfaces properly and fully. So far has this factor been lost to view that frequently technicians have set out to compare two testers of the same design which are of different age and which have been run on different stocks. No conclusions can be drawn as between two testers, or for that matter between two screens, unless it be known that the chemical condition of their surfaces is exactly the same.

Standardization by the hydraulic procedures turned out to be unsatisfactory, and a change was made from water to stock as a means of standardizing. The theory changed from that of flow properties as measured with water to that of comparison of a given screen with a "master" screen with respect to a given batch of stock. As to the funnel separating the quick flow from the slow, that was left to dimension, but it was used under the screen to obtain the readings on the given stock which in turn would disclose the difference, if any, between the screen up for test and the "master" screen. No one outside the room where this is carried out may know either the stock used or the screen kept as "master," but any experienced person could know that the "master" screen is subject to quite as much change in flow properties as any other screen, and further that any procedure designed to bring the "master" screen to a known chemical condition before every test will, if repeated enough, change it dimensionally as well as chemically. In short, there can be no such thing as a "master" screen so long as it is subjected to use.

What Standardization Suggests

There is little doubt that those who undertook to standardize the laboratory freeness test had it in mind that they would produce something as absolute as the thermometer. The limitations on that ambition imposed by the facts had become familiar before standardization was attempted, but the voices of those to whom they were familiar were lost in the enthusiasm for the absolute. Standardization went forward, or if it did not, there was no lack of push. So much was written and spoken on standardization in this test that businessmen unversed in technology got the idea that when a freeness tester is bought the money goes for something standard in the absolute sense and that the figures derived from its readings may be taken, like dollars and cents, for a universal basis of values regardless. Unless the technician can give the layman the true picture, first getting it clearly himself, the usefulness of freeness testing is impaired rather than enhanced. And up to now, no one has produced an absolute standard of freeness testing. In the foreseeable future, no one will.

What Actually Happens

No matter by what means a freeness tester may have been checked, or against what supposed standard, when it issues to the laboratory or the mill it becomes conditioned, as a fourdrinier wire is seen to become conditioned, to the stocks it is used to test. That conditioning process takes a period of time, but after a week or two of use the tester is no longer the same tester that came shining out of the standardization room. The screen has turned dark and the interior surfaces have assumed the tarnish that the stocks used give them. Barring extreme situations, where salts and gums deposit in appreciable depth on the interior surfaces, the tester has now got down to a quite constant condition, and can then be depended on to give comparative readings that are of inestimable value. In that condition it can go on dependably for years on end. The principal precaution, after the routine of the test has been mastered, is to disregard any readings made when any of the interior surfaces may be dry. Before starting a series of tests, the operator must run water through to wet them.

Because of all this, the test for freeness, whether made in the laboratory for investigation or in the mill for control, is not to be accepted as standard, for its value is for purposes of comparison, showing in what direction any given influence on the stock carries it with respect to freeness. That use of the test is invaluable.

What to Do

Notwithstanding the baffling variables that plague the standardizing committees, there is virtue in having all the testers as nearly alike as possible when they are new, and to that extent the ambition to standardize merits support. Having them alike when new does not mean that they will stay alike when used in different places, and it does not make thermometer readings out of freeness determinations, but it does tend to keep freeness figures within some bounds.

There remains, therefore, the question how best to make that amount of uniformity practically effective. One thing can be defined about a new tester beyond question — its dimensions. They can be set out clearly and with precision, along with all allowable tolerances. A second thing, not quite so clear and definite, is the conditioning of the interior surfaces. A simple direction can be given on that point establishing a defined degree of chemical cleanliness, and perhaps specifying how this is to be arrived at. But that second point is of less consequence, since any tester reasonably well cleaned inside will soon acquire the conditioning imposed by its particular use. These two things clearly set forth will provide standardization in the test for freeness.

An Important Factor in Competition

Every company recognizes today that we are about to enter a period of keen competition. As we increase the amount of civilian output following Victory, our products will come into keen competition with products of other companies.

Cost and quality of products are going to be two principal factors in meeting competition. People have become pretty well "fed up" with poor quality products. More and more people are getting into the mood to be very exacting about quality as soon as products come back to the market.

If every department in your company is given the same kind of quality supervision you give your department, how well do you think your company will be able to compete? (From *Management Information,* Elliott Service Company.)

Maintenance of Chippers

N. P. WARDWELL, Carthage Machine Company

▶▶▶ PERHAPS THE CARE of knives is not strictly a repair item. Yet the subject is so very important that every chance to emphasize it should be utilized. So many knife grinders are built wrong and so many of the older knife-grinder men are prejudiced against a change that improved techniques have not developed as rapidly as they should.

Here are just a few pointers on knife grinding:

1. Knives in a grinder should have their blades pointing upward so that the cooling water will wash grit away from the individual knife edge instead of toward it (Figure 1).

2. Cup wheels should be used for grinding to prevent concaving knife bevels.

3. Wheels should turn in a direction that causes grit to rub away from the cutting edge instead of toward it.

4. Knives should be honed with a hand stone or buffing wheel after grinding to take off wire edges.

Curved bed knives can be ground a few times on the flat, almost vertical face next to the disc on a regular knife grinder without bothering about the curved surface. In order to keep the cutting edge in the same vertical plane as it was previous to grinding, shims should be inserted beneath the follow plates (Figure 2) that engage the stops against which the bed knife is set. These shims should be set in and the combined length checked by the grinderman.

A bed knife may be adjusted forward in this way until the top of its slope lines up with the slope of the spout.

When this point has been reached, the bed knife should be built up along the edge with a hard surfacing rod. This resurfacing metal can be sweated on with an acetylene torch. Then the curved surface can be ground down to line up with the contour of the spout. The flat, almost vertical face can be ground on a regular knife grinder.

The slope of the bed knife is more gentle than the slope of the spout, and the spout overhangs the top of the bed knife when new (Figure 3). This arrangement allows leeway for adjustment after grinding and also takes wear off the spout.

It is of the utmost importance to keep the bed knife edge out where it belongs. Otherwise, logs will rock or catch on its flat top surface and make slivers; and, in addition, the disc will wear faster. This condition shows up the worst on a disc in which the knives run clear through because the slope from a knife edge to disc surface is more abrupt.

The care of straight bed knives is the same as for curved bed knives except that the beveled surface can be ground on a regular knife grinder. The bevel should be of a more gentle slope than that of the spout and no ledge should be left for logs to catch on. A hard surfacing rod can be used to build up this type of bed knife with the aid of acetylene. The entire bev-

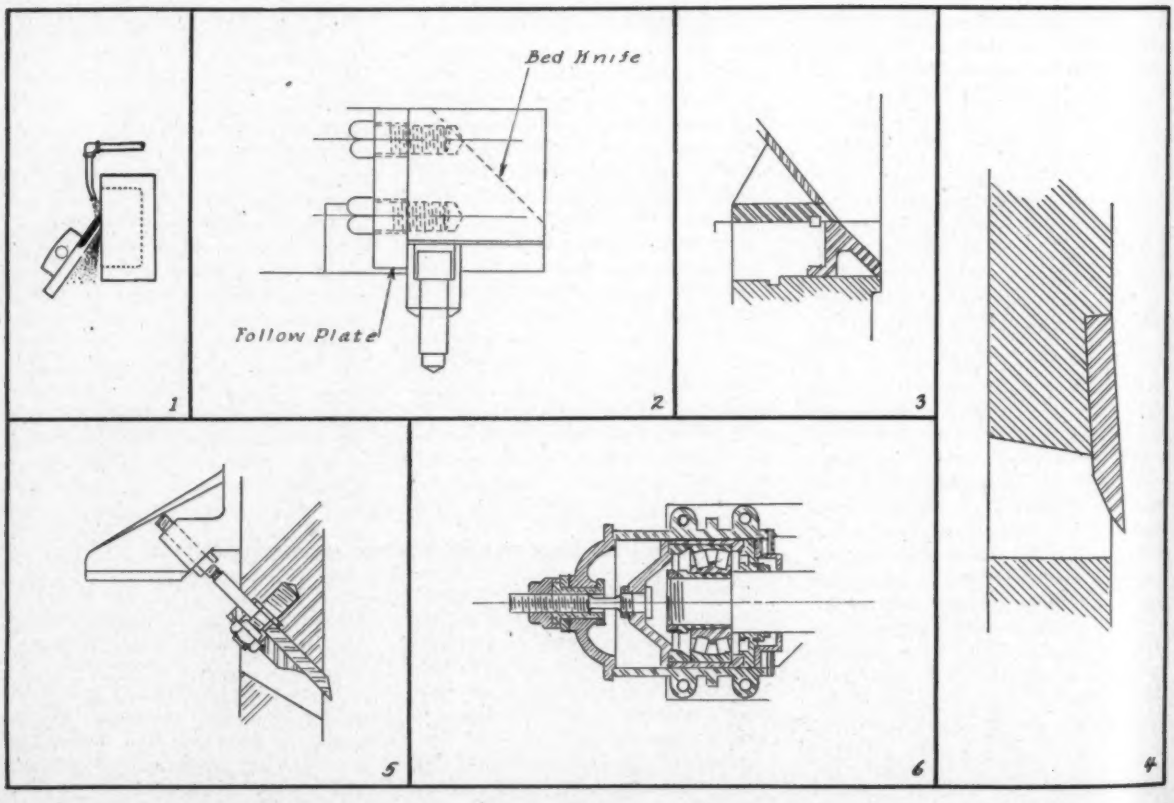


Fig. 1—Proper method of grinding knives. Fig. 2—Bed knife and stop block. Fig. 3—Relative slopes of spout and bed knife. Fig. 4—Knife lying in disc surface. Fig. 5—Knife setting through disc. Fig. 6—Thrust bearing.

eled surface should be covered. Otherwise, the soft metal above the edge might wear and the hard surface on the edge might form a fin that would catch the logs. The edge can be renewed more often than is needed by the surface.

Steel spouts are not lined. When these spouts become worn, they can be taken out and built up with welding rod. If the spout should become worn too much on the inside or outside (inside wear is more common with 10-knife chippers) the log might rub on the disc outside the knife path. As a result, only a part of such logs would be cut at first and then nothing more could be cut from them until they rolled enough to become exposed to the knives. Sometimes the uncut part of a log breaks off and makes slivers. Also this trouble with a 10-knife chipper in which the knives are set through the disc will wear the edge of the inside ring that clamps down the disc wearing plates.

Wear in the spout, therefore, should be watched carefully. When a straight edge is held down inside a spout and rubbed around its contour, it is easy to determine with the aid of a flashlight the extent of wear. If the wear is on the bottom and there is a ledge formed by the flat top of the bed knife, it is a pretty safe deduction that the bed knife bevel is too steep and should be ground back.

Cast iron spouts have steel linings. Except in very old spouts, these linings are turned on the outside to fit bored recesses in the spouts. In a chipper turning out 100 cords a day, a liner should last nine months. These liners can be built up with welding if desired; and doing so might save considerable delay in such times as the present.

The harmful effects of a worn spout begin to be felt when the ledge on the top of the bed knife exceeds $\frac{3}{16}$ in.

All disc wear causes uneven chips because logs bearing on one part of a disc surface can work in farther beyond the knife edge than others. Also there is more danger of logs tipping over into the worn spots of a disc, especially in the 4-knife type.

All old discs that have no wearing plates can be turned down and plates installed. Then such plates can be renewed when worn. Likewise, old discs can be refaced and the knife pockets planed out down to a disc thickness of $3\frac{1}{2}$ inches at the wearing surface.

Some mills have turned the disc surfaces right in the chipper bearings. On 4-knife chippers where knives lie in the disc face (Figure 4), this practice causes the knives to project farther with each turning and a longer chip results. The original chip length is obtained by planing the knife pockets. When knives are set through the disc (Figure 5), planing of the knife pockets is unnecessary.

Attempts have been made to chip the knife pockets down to the proper level after the turning operation. In the experience of the author, the results of this procedure have always been poor. In fact, the author believes it impossible to get the pockets even enough in this way for a chipper to make good chips.

In some instances, where chipper discs have been worn, the suggestion has been made to grind down the high spots just opposite the knife openings in order to produce chips of the same length all across the knife edges. Of course, such a grinding operation would made the chips uniformly longer. However, in discs with knives set through, it is easy to bring this setting back to obtain the original chip length. On the newer discs, with knives lying in the surface, the filler piece under each knife could be thinned a corresponding amount. So far as known to the author, this technique has not been tried.

When wearing plates are installed on a 4-knife chipper, filler pieces are set under each knife. The chucking that occurs when the knife bolts stretch causes these filler pieces and the disc surface under them to wear, but wear is not as rapid as with the bare surface.

Some wear does occur in the knife pockets of 10-knife chippers, but this wear is provided for by wearing plates on the disc face.

Grease of rather definite characteristics should be used in the antifriction bearing housings (Figure 6). The grease should be chemically stable. It should not cause corrosion or rust. Neither should it stick to the bearings. Yet it should not thin out sufficiently at operating temperatures to cause leakage.

This grease should be flushed out of the housings and replaced twice a year.

The thrust bearing is encased in a sliding cartridge. The grease fitting that enters the cartridge rides in a slot at the top of the housing. Oil should be kept around this fitting to lubricate the outside of the cartridge. When flushing and replacing grease, it is advisable, though not necessary, to take out the end plate of the cartridge. The back bearing works the same way except that the grease fitting does not slide with the bearing.

The newer chipper bearings have tapered sleeves which can be drawn out with a removal nut. This feature very much facilitates a change of bearing.

Green Liquor Addition of Synthetic Salt Cake

VERNON WOODSIDE, The Mathieson Alkali Works (Inc.)

▶▶▶ SYNTHETIC SALT CAKE, which is an intimate fusion of soda ash and sulphur in the correct molecular proportions, was originally introduced when the outbreak of World War II threatened to cut off the supply of imported salt cake. Investigations since then have demonstrated that the synthetic product makes possible a revolutionary change in the kraft pulping process, by permitting the addition of make-up chemicals at the green liquor stage. Such addition gives greatly improved control over pulping operations, and therefore uniform high quality pulp, and also reduces costs.

Synthetic salt cake, it has been found, does not require smelting. When this free-flowing powder is added to the green liquor in the dissolver tank, it goes into solution readily. The cooking liquor which is formed upon subsequent causticization gives results comparable to those obtained from liquor made in the usual manner.

The method of synthetic salt cake addition may vary according to plant custom. For plants operating on a continuous system, the first wash may be added to the dissolver tank, the synthetic salt cake added continuously at a predetermined rate, and the green liquor withdrawn to the causticizing tank as it reaches the desired concentration.

Where a batch system is used, a measured quantity of wash from the lime mud filters is added to the dissolver tank, and then a measured quantity of synthetic salt cake. Smelt salts

are then run into the dissolver tank until the resulting solution is of the proper concentration, when the liquor is drawn off to the causticizing operation.

While the best results have been obtained with concentrations of from about 0.9 to 1.1 pounds, calculated as sodium oxide, per gallon of cooking liquor, the concentration of active chemicals in the cooking liquor may be varied in different operations.

Satisfactory results have been obtained in continuous feed operations using 0.261 to 0.321 pound of synthetic salt cake per gallon of green liquor. In one process operating according to batch procedure, 1500 pounds of salt cake were added per batch, this being equivalent to 0.335 pound per gallon of green liquor.

In any case, the required amounts and proportions of synthetic salt cake may be readily determined by the routine liquor analysis. Thus, by proportioning the addition of the make-up chemical to the smelt salts, a single control insures a uniform cooking liquor and pulp.

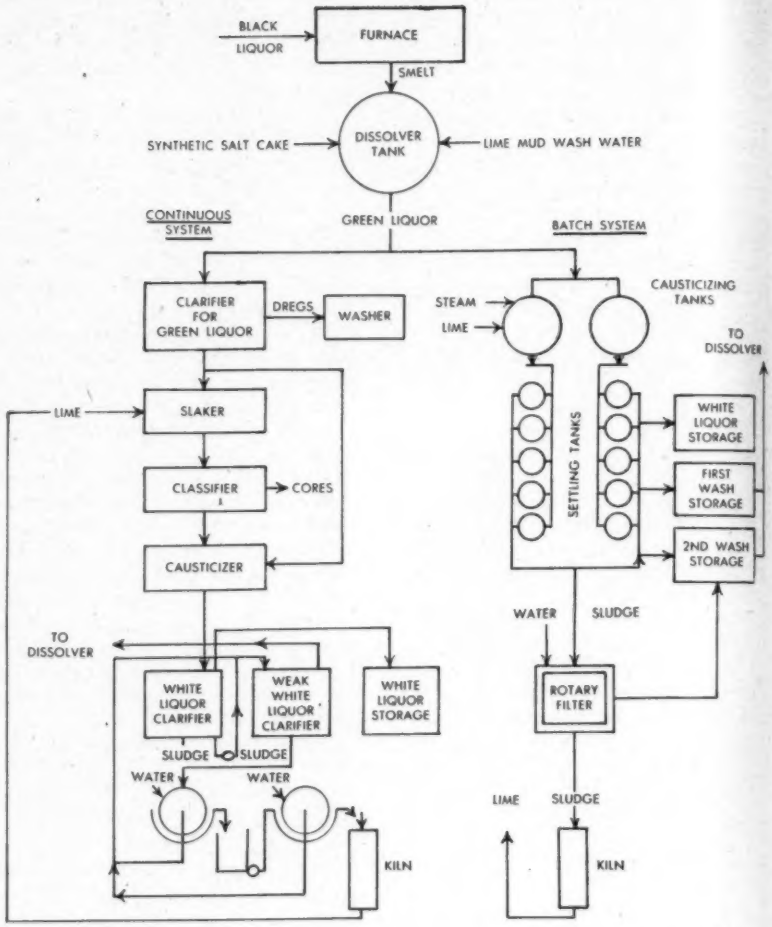
Theory of Kraft Pulp Chemistry Changed by New Procedure

This new procedure effects a radical change not only in the kraft pulp process, but also in the theory of kraft pulp chemistry.

By-product salt cake, after reduction in the furnace with the black liquor, gives sodium sulphide and sodium carbonate in the green liquor. Causticizing the green liquor converts the carbonate to hydroxide, so that sodium sulphide and sodium hydroxide are the active ingredients of the white liquor. Small amounts of polysulphide which may be present have been regarded as useless, or even harmful. However, when synthetic salt cake is dissolved in the green liquor and causticized, the sulphides occur chiefly in the form of polysulphides. In a continuous commercial operation using this process, the average ratio of polysulphide to sulphide was 1.8:1, as compared with 0.25:1 in the conventional kraft cooking liquor. Satisfactory results have been obtained when the ratio of polysulphide to sulphide was as great as 50:1.

The exact role of polysulphide in the cooking liquor is as yet undetermined, but there can be no question that it may be present without harm to the pulp. Moreover, since polysulphide may represent 50 per cent or more of the sulphidity of a satisfactory liquor, we must conclude that polysulphide plays an active part in the pulping process, and can satisfactorily replace a large proportion of the sodium sulphide.

Furthermore, previous fears that corrosion would result from a high percentage of polysulphide have been contradicted by laboratory and plant tests. One mill has operated this process for a year with no increased corrosion.



Kraft recovery system showing application of synthetic salt cake.

Advantages of the New Procedure

The addition of the active ingredients directly into the green liquor, without preliminary reduction in the furnace, yields several economies.

The saving in heat, on the basis of 30,000 pounds of salt cake per day, is equivalent to about 600 gallons of oil per day. Considerable sulphur is also saved because primary flue gas losses are eliminated and the reduction to sulphide is increased, synthetic salt cake reduction often running as high as 95 per cent.

The space which the salt cake make-up usually requires in the smelting furnace becomes available for additional black liquor, giving an increased furnace output per unit time.

The black liquor mixing tank ordinarily used in the introduction of salt cake may be eliminated.

Greatly improved control over operations is the chief advantage of adding synthetic salt cake to the green liquor, rather than to the furnace. Furnace operation is more uniform, since fluctuating quantities of salt cake are not being added to the black liquor. This results in a much better reduction and a more uniform smelt.

Where an increase in white liquor is necessary, it may be accomplished simply by adding increasing amounts of synthetic salt cake to the green liquor without upsetting the smelt analysis or the efficiency of the furnace operation. Even where the increase is large and sudden, the composition of synthetic salt cake keeps the sulphidity of the resulting white liquor relatively constant. Thus, the variables in the cooking operation, so far as the white liquor is concerned, are reduced, and the efficiency of black liquor recovery and white liquor manufacture is increased.

Paper SKETCHES . . . . . .

THE BOSTON JOURNAL PRINTED AN EDITION ON PAPER MADE OF BASSWOOD IN 1863.

IMITATION "OSTRICH PLUMES" MADE OF CREPE PAPER WERE EXTENSIVELY USED ABOUT 1910 TO DECORATE LADIES HATS. THESE ARTIFICIAL PLUMES WERE STIFFENED WITH WIRE, TIGHTLY WOUND WITH PAPER.

WESTERN CARTRIDGE COMPANY EAST ALTON, ILL., RECENTLY ANNOUNCED THE DEVELOPMENT OF A PROCESS FOR PRODUCING SMOKELESS POWDER FROM KRAFT PULP. ACCORDING TO THE ANNOUNCEMENT, A PIECE OF PULP ONE-SIXTEENTH OF AN INCH WIDE AND TWO AND ONE-EIGHTH INCHES LONG IS SUFFICIENT TO PRODUCE ENOUGH SMOKELESS POWDER TO LOAD A CARTRIDGE FOR THE ARMY'S NEW WINCHESTER CARBINE.

THE ANCIENT CHINESE PAPERMAKERS SIZED THEIR PAPER WITH A THIN RICE STARCH.

ALLIED

TIMKEN CO. PRESENTS DIORAMIC INVASION DISPLAY TO MUSEUM

The first dioramic display, the first to employ motion in three elements — on land, sea, and in the air — has been built by The Timken Roller Bearing Company, Canton, Ohio, for the Museum of Science and Industry in Rockefeller Center, New York City.

Designed and constructed by Messmore & Damon, specialists of New York City, the display shows a landing scene on the Normandy coast. In the immediate foreground, a row of tanks, guns and armored vehicles travel from right to left across the beachhead, while more streams of mechanized equipment pour from the ramps of three LST boats offshore.

All vehicles are authentic reproductions, built true to scale, as are the airplanes suspended on invisible wires. The contributions of the Timken Company to the war effort are shown in translite panels on each side of the landing scene. The company name and title of the display are cut-out wood letters, indirectly lighted.

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▶▶▶ TO FACILITATE TRAVEL for its executives concerned with war work, Hercules Powder Company, Wilmington, Delaware, has purchased a five-passenger, 450 hp., twin-engine, monoplane. The plane will be used by executives between the home office and ordnance plants operated by the company in Virginia, Tennessee, Missouri, Kansas, and Wisconsin.

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GENERAL ELECTRIC ADDS CHEMICAL DEPARTMENT

A new department to be known as the Chemical Department, has been created by the Board of Directors of General Electric Company, Schenectady, New York. Dr. Zay Jeffries, technical director of the company's Lamp Department, has been elected a vice president in charge.

The announcement states that the creation of the new department which became operative January 1 was in accordance with the company's policy of modifying the organization structure to enable it to take full advantage of opportunities for future growth.

The new Chemical Department will assume responsibility for the operations pertaining to the Resin and Insulating Materials Division and the Plastics Division of the Appliance and Merchandise Department.

Dr. Jeffries has been technical director of the Lamp Department since 1936. He began service with the company in 1914 as consultant with the National Lamp Works.

ARMY-NAVY "E" AWARDS

Goulds Pumps, Inc., Seneca Falls, New York—At an impressive ceremony held in the company's plant on December 14, N. J. Gould, president of the company, received the "E" pennant from Comm. Robert S. Smith, Jr., U.S.N., Inspector of Navy Material, Buffalo. Attending the presentation were 900 workers of the company. The company has been engaged in producing pumping equipment for wartime use since before Pearl Harbor.

Harris-Seybold-Potter Company, Cleveland, Ohio — Two divisions of this company received Army-Navy "E" awards on succeeding days. Both divisions are turning out war goods at a high capacity — far in excess of the normal volume of peacetime production. On December 11, the Harris Division at Cleveland received its "E" pennant, and on the following day the Seybold Division at Dayton had a similar presentation. R. V. Mitchell, chairman of the board of the company, was master of ceremonies at both presentations. The "E" flag was presented to both divisions by Commander C. O. Triebel, U.S.N. A. S. Harris, president of the company, and son of one of its founders, received the award for the Harris Division; and N. O. Scourfield, manager of the Seybold Division, received the award for the Dayton plant.

Second Star: Infilco Incorporated, Chicago, won distinction for meritorious production in the war effort for the third time when it received the second white star for its Army-Navy "E" pennant in December. The company has 61 employees in the armed forces.

Second Star: The Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc., Passaic, New Jersey, has had the second white star added to its Army-Navy "E" pennant. The company was presented with the original award on October 28, 1943, the fiftieth anniversary of its founding.

Fourth Star: The fourth star was added to the "E" pennant of Automatic Transportation Company Division of the Yale & Towne Manufacturing Company, in Chicago, on December 13. Fitting ceremonies were held to mark the occasion, which preceded the company's Christmas party. Representing the Government at the ceremonies were Lieutenant (s.g.) Richard T. Tiebout, Bureau of Naval Ordnance, Washington, D. C., and Lieutenant (j.g.) A. M. Thompson, Bureau of Civilian Personnel, Chicago.

Fourth Star: The Chain Belt Company, Milwaukee, Wis., has just received another star for its Army-Navy "E" pennant. The original award was given the company in September, 1942.

Fifth Star: One of the first companies to be awarded five stars for its Army-Navy "E" pennant is the Bausch & Lomb Optical Company, Rochester, New York. The company won its first "E" pennant on July 25, 1941, more than four months before the attack on Pearl Harbor.

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H. W. BUTTERWORTH ACQUIRES PLANT OF TEXTILE FIN. MACH'Y

The purchase of The Textile Finishing Machinery Company, Providence, Rhode Island, by the H. W. Butterworth & Sons Company, Philadelphia, has been announced. The purchase was made as of December 7, 1944.

The Textile Finishing Machinery Company went into receivership in November, 1943. It was acquired by Jacob Ziskind, who negotiated the transaction with Butterworth company. The plant at Providence will be continued in operation as a Division of the Butterworth organization under the management of Edward Wharmby, who, for many years, has been associated with the Textile Finishing Machinery Company.

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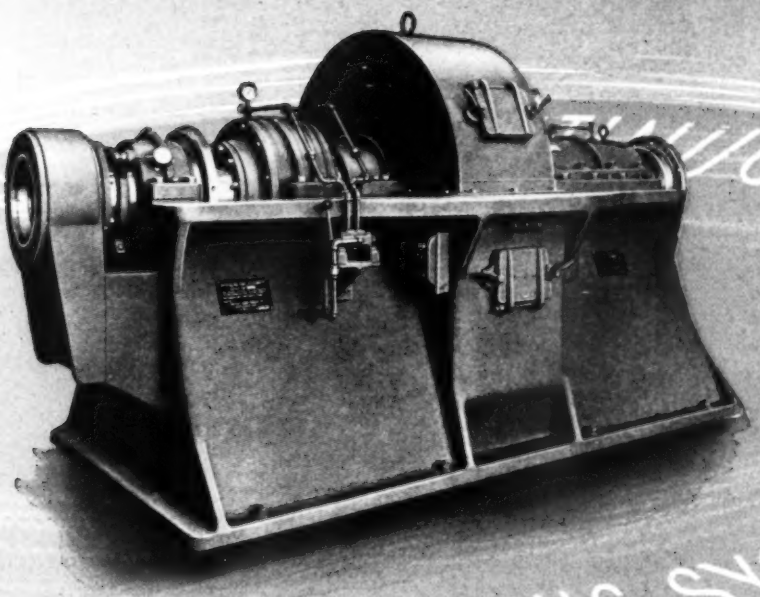
▶▶▶ ALL THE STOCK of the Askania Regulator Company, Chicago, has been acquired by General Precision Equipment Corporation, of New York City. The purchase was made for cash, but the amount of the transaction was not disclosed. The announcement of the purchase states that the present management of Askania will continue to be in charge of operations.

SUTHERLAND *continuous beating and refining system*



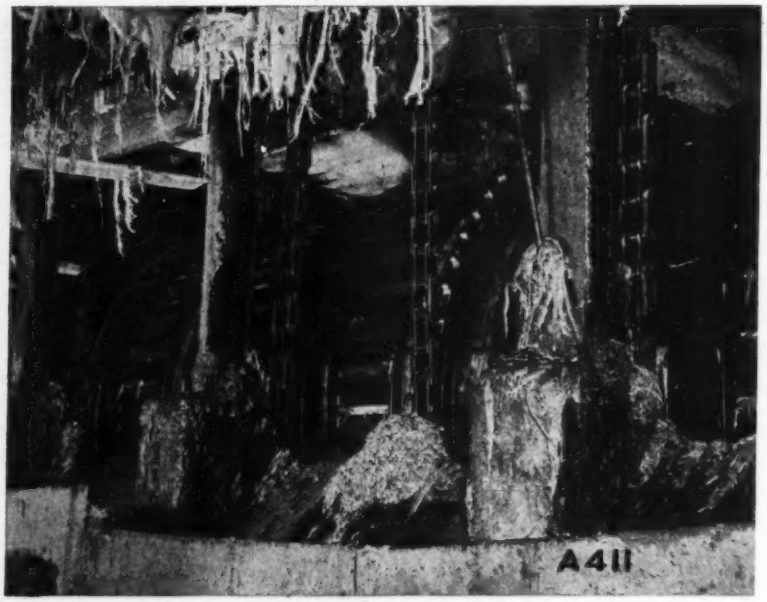
One Sutherland Alone prepares furnish of one paper machine making Bond, Book and Specialties.

SUTHERLAND
REFINER CORPORATION

TRENTON, NEW JERSEY

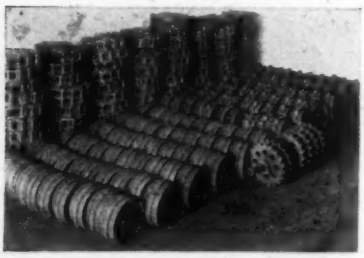
Manganese Steel Chain for Barking Drums *Resists Stresses and Abrasive Wear*

The chain used to support and drive barking drums must not only have high tensile strength with in this service. One metal is outstanding in its ability to "take it" under conditions of this kind.



A-411 Side view of a 10' x 30' barking drum in a Wisconsin paper mill suspended by Amsco manganese steel chain.

and ductility to support and turn the weight of the drum, but it must also be able to withstand the abrasive and frictional wear met



320 Special cotterless combination chain, with sprocket wheels and idlers made for use on a 12' x 45' barking drum.

It is austenitic manganese steel, "the toughest steel known." It retains its body toughness as it becomes extremely hard on the surface from constant impacts or pressure.

Manganese steel has also proved effective for other barking drum applications such as drive pinions, sprockets, idlers, traction wheels, rollers, etc. Bulletin No. 144-L describes these and other uses in the paper and lumber industries.

Gritty, corrosive or heavily loaded liquids do not faze Amsco-Nagle Centrifugal Pumps—Bulletin 940 tells why.

Amsco

AMERICAN MANGANESE STEEL DIVISION

Chicago Heights, Illinois

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OFFICES IN PRINCIPAL CITIES

AMERICAN Brake Shoe COMPANY

YALE & TOWNE CREATES EXPORT DIVISIONS IN ITS MFG. DIVISIONS

A specialized export department in its manufacturing divisions has been established by the Yale & Towne Manufacturing Company, New York City. Export sales departments and managers in the Stamford and Philadelphia Divisions of the company have already been established, and it is stated that similar plans are being developed to increase the export sales of the Automatic Transportation Division in Chicago.

The new divisional export sales managers are Victor R. Ball, for the Philadelphia Division, and Henry C. Gebhardt for the Stamford Division.

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▶▶▶ THE ADOPTION OF an Employees' Retirement Plan for United States employees of American Cyanamid Company, American Cyanamid & Chemical Corporation, Chemical Construction Corporation, Davis & Geck, Inc., and Lederle Laboratories, Inc., became effective January 1.

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MONSANTO TO BUILD SULPHURIC ACID PLANT

At the close of the year, Monsanto Chemical Company, St. Louis, Missouri, announced plans to construct a new sulphuric acid plant, with a yearly capacity of 72,000 tons, in the plant area of its Monsanto (Ill.) properties.

It is expected the new plant will cost about $700,000. Equipment is on order and construction will begin in about three weeks. The company's Illinois plant is one of the Midwest's large producers of sulphuric acid. The new plant is designed largely to meet requirements growing out of increased production of explosives.

◆

▶▶▶ THE GROWING INDUSTRIES of the South will be provided with better packaging service, according to a recent announcement from E. I. du Pont de Nemours & Company. The announcement states that a sales office has been opened in Atlanta (Ga.) by the Cellophane Division of the du Pont company. R. E. Sidwell, southern district sales manager, will be in charge of the new office.

◆

▶▶▶ A RETIREMENT pension plan has been inaugurated by Farrel-Birmingham Company, Inc., for the employees of its three plants at Ansonia and Darby, Connecticut, and Buffalo, New York.

Dryer Felts

"Engineered" to Each Mill's Requirements

With experience in the manufacture of dryer clothing, dating back to the beginning of the modern paper dryer, HOOPERWOOD "Canvas Engineering" has produced not one but several distinct types of Cotton and Asbestos Felts.

This policy has been of real assistance to Paper Mill Superintendents, in suiting the particular requirements of their mill—even down to each machine position, if desired.

Therefore, if it is a rugged, heavy felt you need for fine finish in normal production . . . or a lightweight, extra-porous felt for faster drying . . . or an Asbestos Felt to withstand the advanced temperatures involved in high-speed production of Kraft and other heavy papers—HOOPERWOOD "Canvas Engineering" has the answer to your problem.

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HOOPERWOOD DRYER FELTS

COTTON AND ASBESTOS

ASSOCIATIONS

POSTWAR POLICIES FOR THE UNITED STATES WOOD PULP INDUSTRY*

The purpose of this statement is to outline the policies of the wood pulp industry of the United States in respect to postwar competition, and to define conditions necessary for the maintenance of the industry's position in our national economy. It presents the views of the United States Pulp Producers Association.**

OBJECTIVES

The principal postwar objectives of the wood pulp industry are as follows:

1. To maintain this essential industry in a sound condition.
2. To provide maximum postwar employment for the industry's labor and capital, under American standards.
3. To furnish domestic consumers with a stable supply of satisfactory wood pulp at reasonable prices.
4. To collaborate with government agencies engaged in postwar planning which affects the wood pulp industry.
5. To support efforts to provide the national government with specific powers and machinery necessary to prevent the dumping of foreign pulp and paper in the United States, and to prevent the sale of such foreign products in this market on any other basis than that resulting from fair and equitable competition with American producers under American standards.
6. To seek an equality of opportunity with foreign producers in the sale of wood pulp in other world markets which United States pulp producers can serve effectively and economically.
7. To cooperate with organizations representing buyers and sellers of pulp in developing basic statistics on wood pulp supply and demand.
8. To foster sound practices of timberland management and pulpwood production.

POSITION

The United States is the world's leading producer and consumer of wood pulp. The domestic pulp industry's capacity has expanded from a prewar maximum of nine and a half million tons per year, to a present capacity of more than eleven million tons. Its actual production, under difficult war conditions, exceeded ten and three quarter million tons in 1942.

The United States wood pulp industry consumed nearly seventeen million cords of pulpwood in 1942, of which fourteen and a half million cords were cut in this country. It also uses very large amounts of coal, chemicals, and both water and electric power. The cost of all materials, including pulpwood, used annually by the pulp industry, is estimated at more than a quarter of a billion dollars.

The majority of pulp mills in the United States are integral parts of paper and board manufacturing plants. Pulp and paper units help to support over five hundred American communities. One hundred twenty-five towns in this country are actually 90 to 100 per cent dependent on local pulp and paper mills; twenty-seven towns are 70 to 90 per cent dependent; thirty-nine towns 50 to 70 per cent dependent; and more than two hundred fifty are up to 25 per cent dependent on their local pulp and paper industry.

The products of the United States wood pulp industry are inextricably woven into our whole social and economic fabric. This nation's position as regards the printed word, communications, product containers, sanitary products, new fiber-base products and its major contribution to the successful prosecution of the war would have been impossible without a strong domestic wood pulp industry.

It is thus evident that in peace or war, domestic production of wood pulp is essential to the nation's security and economic progress.

1. Necessity for a Strong Domestic Pulp Industry

The domestic wood pulp industry recognizes as its paramount consideration, the welfare, security and economic progress of the United States. It is convinced that it can operate successfully only when our national economy is on a healthy and profitable basis.

The industry believes that the interests of this country will be best served by the adoption of trade policies and practices which make possible the maintenance of a strong and vigorous domestic wood pulp industry, with maximum employment of its labor and capital.

The necessity of maintaining a strong domestic pulp industry has been amply demonstrated by the industry's contribution to our national war effort.

When war came, it was necessary for American industry and commerce to concentrate immediately on the production of essential goods and services. The wood pulp industry of the United States met that challenge. Despite increasing difficulties resulting from shortages of labor, wood and transportation, this basic American industry increased its production of the specialized pulps essential to the war effort, and at the same time also increased its production of the pulps required by the government agencies and the civilian population of the United States and those of many of the Allied Nations.

It seems assured that the demand for wood pulp will increase substantially in the postwar period. The domestic pulp industry must of necessity provide most of the wood pulp needed to satisfy that demand. Therefore, in order to ensure both our national security and economic progress, it is clearly evident that the wood pulp industry of the United States must be maintained in a strong and vigorous condition. Its normal and logical growth must not be prevented by unfair foreign competition if this country is to be assured of the supplies of wood pulp which may be needed in both war and peace.

The wood pulp industry of the United States is not seeking tariff protection. It will, however, endeavor to maintain its essential position in our national economy by seeking, through every possible legitimate means, to prevent unfair competitive trade practices which enable foreign producers to dump wood pulp in this market at less than fair values based on American costs of production.

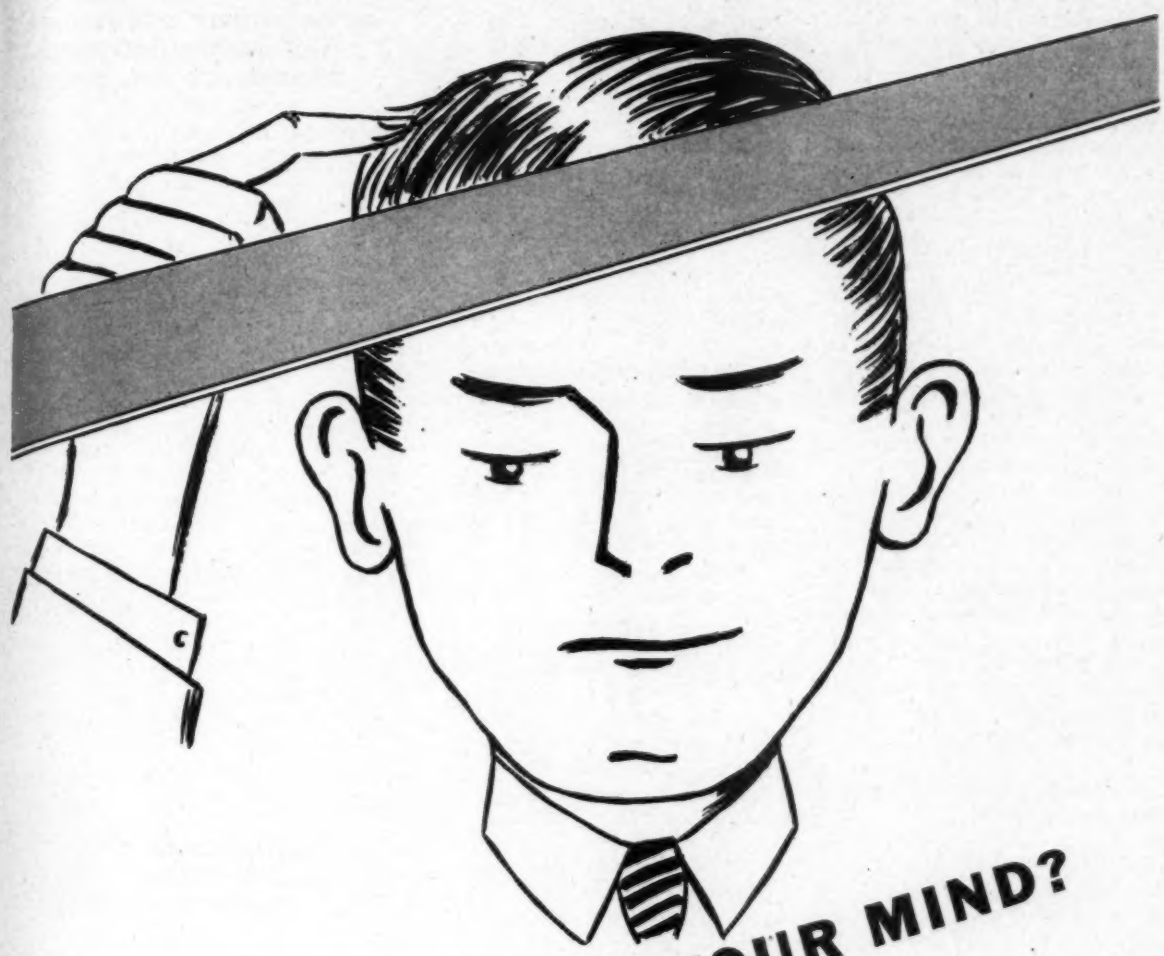
The domestic wood pulp industry will consider as unfair competition any form of dumping or sales of foreign pulp which are fostered by depreciation of foreign currencies foreign subsidization and other inequitable practices.

2. Relations with Domestic Consumers and Foreign Producers of Wood Pulp

The wood pulp manufacturers of the United States believe that organizations representing respectively the buyers and sellers of pulp should undertake the development of such statistical and economic surveys as will keep both producers and consumers of pulp continuously informed regarding

(*) This statement of postwar policies and objectives for the domestic wood pulp industry has been prepared and adopted by the U. S. Pulp Producers Association, 122 East 42nd Street, New York 17, N. Y., and released in pamphlet form.

(**) The United States Pulp Producers Association represents more than 80 percent of the wood pulp sold by the domestic pulp industry, and over 60 percent of all of the wood pulp produced in the United States.



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Check with us if the condition of your felts is not all it should be.

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stocks, production and market requirements for wood pulp.

A program for the development of these surveys is proposed by the domestic pulp industry. It contemplates the collection and dissemination of all proper information beneficial to the producers and consumers of wood pulp. Such surveys should cover not only broad geographical markets, but also actual and prospective consumption by various industries and their component parts.

The wood pulp manufacturers of the United States are prepared to exchange basic statistics with foreign pulp producers. Such an exchange, subject to applicable laws and approval of governmental authorities if necessary, would cover past, present and probable future world supply and demand for wood pulp and pulpwood.

To these ends, it is believed that arrangements should be made for periodic international conferences of wood pulp producers, to be held alternately in Europe and North America. All necessary preliminary steps for that purpose should be taken as soon as possible.

3. Postwar Government Control of the Pulp Industry

Relinquishment of government controls. In common with other national industries, the wood pulp industry of the United States has recognized government regulation of production, distribution and consumption of wood pulp as necessary for the effective prosecution of the war.

It also recognizes that such controls can not be abandoned abruptly. It believes that they should be relinquished as rapidly and completely as practicable.

Industry participation in government postwar planning. Should there be necessity for any temporary postwar regulation of wood pulp imports and exports, such government regulation should be kept to a minimum and adjusted to the progress of world economic recovery.

Full provision should be made for industry collaboration with the responsible government agencies involved in such a program.

The wood pulp industry of the United States recognizes the need for early rehabilitation of the countries suffering from the effects of war. It is prepared to supplement the distribution of foreign pulp for this purpose, to the extent that its production may be sufficient to supply both the anticipated domestic postwar needs and that part of the world's essential cellulose requirements which can not be obtained from accumulated foreign stocks or foreign production.

International currency stabilization. The industry believes that the maximum development of postwar international trade and world economic recovery can be obtained only under some form of international currency stabilization which will maintain an equitable and stable relationship among all currencies affected by international trade.

4. Timberland Management

The domestic wood pulp industry is an important forest products industry. Its timberlands are a renewable natural resource. The industry fully appreciates the desirability of more complete forest utilization, and of more extensive reforestation.

Proper management and development of its forest lands can be obtained only under a national economy which makes possible the profitable utilization of all forest resources, and which will encourage and justify the long-term investment necessary to ensure a permanent supply of pulpwood for the domestic industry.

The wood pulp industry of the United States will support sound state and federal forest tax laws, which recognize the necessity for the same opportunity for profit from forestry operations as from any other commercial activity.

CONCLUSIONS

The wood pulp industry of the United States recognizes and accepts its national obligations to provide a stable supply of wood pulp at reasonable prices. To that end, the industry intends to keep its plants and equipment in the best possible condition, to promote greater forest development and utilization, and to keep pace with the best technological developments in wood pulp production.

The wood pulp industry of the United States proposes to meet foreign competition on a basis of fair international trade. It will insist upon an equal opportunity with its foreign competitors for maximum postwar employment of its labor and capital. To that end, the industry proposes to use every legal resource at its command, and to seek government assistance if necessary, to ensure fair and equitable competition in the merchandising of its products. By so doing, it hopes to maintain its essential position in our national economy and to contribute its full share to the security, welfare and progress of the United States.

APPA PUBLIC RELATIONS PROGRAM UNDER WAY— HEADED BY COL. SCHELL

The American Paper and Pulp Association has formally initiated its public relations program by retaining Col. Frank R. Schell as its public relations consultant. Colonel Schell, who is just returning to civilian life after four years of active duty in the Army, has been engaged in public relations work for over 15 years, his most recent work in this field being for the National Industrial Information Committee, affiliated with the National Association of Manufacturers.

Colonel Schell is a veteran of World War I, as well as of the present War. At the beginning of World War II, he left his own public relations bureau for recruiting and induction duty at the headquarters of the Second Corps Area. He was transferred to Camp Upton as Executive officer, and more recently returned to Governors Island as a member of the Reclassification Board. Upon his return to civilian life, Colonel Schell resumed his former work in the public relations field.

Colonel Schell already has taken up his work with the Association.

◆

MISSISSIPPI GROUP ADOPTS THREE-POINT FORESTRY PROGRAM

A three-point program aimed at the restoration and conservation of Mississippi's timber resources was adopted by the Mississippi Forestry and Chemurgic Association at a meeting December 12 in Jackson.

Immediate objectives of the nonprofit organization fostering better forest practices were announced by F. A. Anderson, of Gloster, chairman of the aims and objectives committee, as follows:

Statewide fire protection with adequate financial support; expansion of the forestry school at Mississippi State College; earmarking of timber severance taxes in the counties so as to directly help the growing of forest trees.

Measures needed for this program will be presented at the next session of the Mississippi Legislature. State Senator J. R. Clark, of Crosby, who heads the association, is chairman of the Senate forestry committee.

Maintenance of an active legislative committee for studying state and federal laws affecting conservation practices, taxation and enforcement was authorized by the association.

The association annually sponsors a boy's conservation school, and recently

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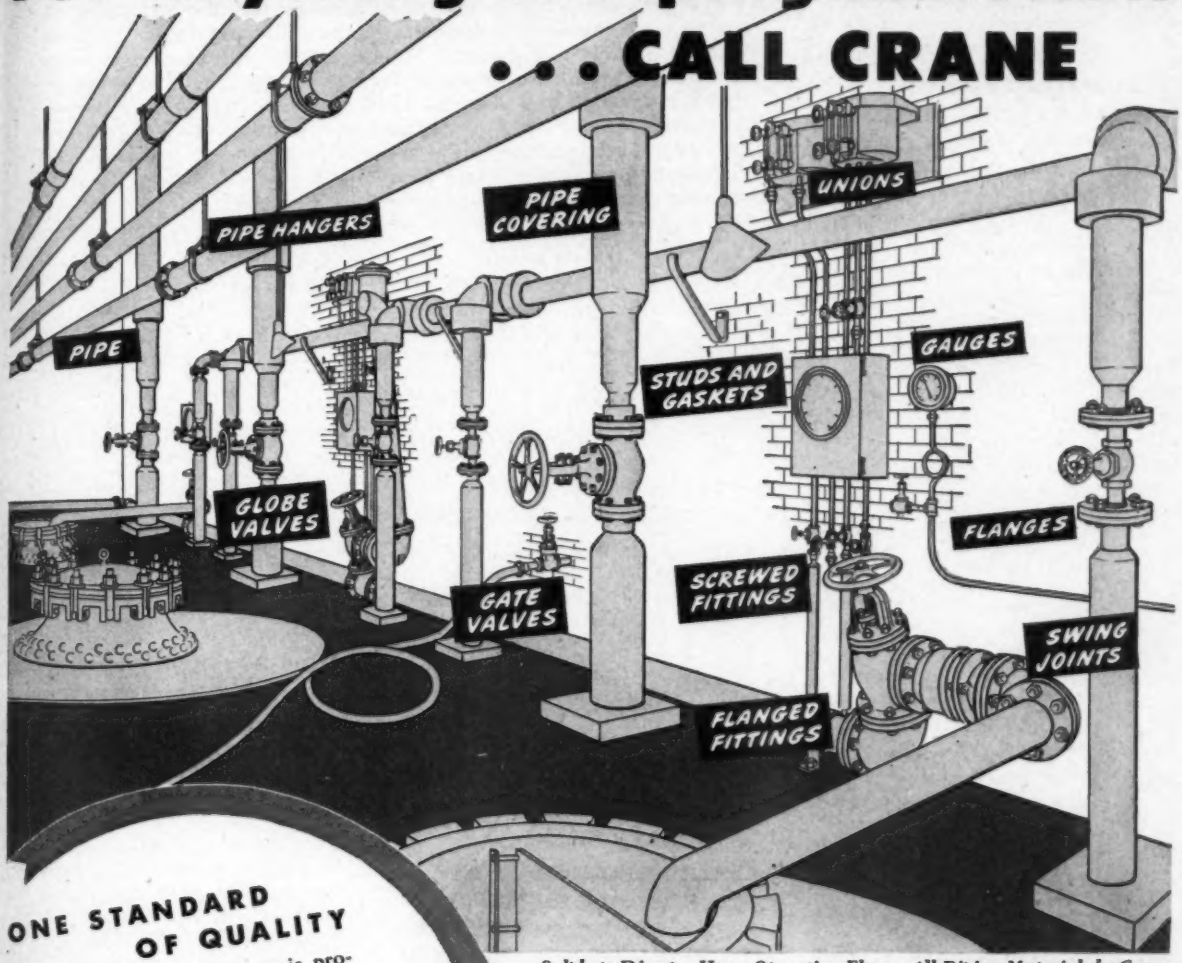
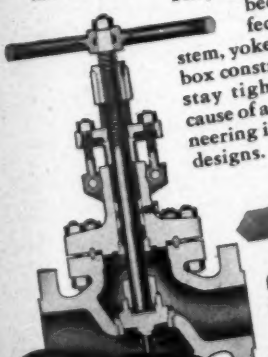


Sulphate Digester House Operating Floor—All Piping Materials by Crane

ONE STANDARD OF QUALITY

Every part of piping systems is protected by the same high quality when Crane materials are used throughout. For example, here's how Crane Cast Steel Globe Valves guard pipe line performance. They safely resist severest stresses with castings developed to the exact degree best suited for valves. They operate smoothly because of perfectly balanced stem, yoke, and stuffing box construction. They stay tight longer because of advanced engineering in their seating designs.



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ONE SOURCE OF SUPPLY . . . ONE RESPONSIBILITY FOR ALL PARTS

From ordering of parts to installing them, Crane *complete* piping materials service simplifies your job of catching up with war-deferred replacements. One source—your Crane Branch or Wholesaler—supplies everything you need for any application. You choose from the world's most comprehensive line of valves, fittings, pipe, fabricated assemblies and piping accessories—in brass, iron and steel—in all pressure classes.

One order covers all your requirements for any job. You have greater assurance of a good installation because one responsibility covers the quality of all parts. In addition, by specifying Crane materials 100%, you get full benefit of Crane Co.'s 90-year experience and leadership in meeting industry's piping needs. CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill.

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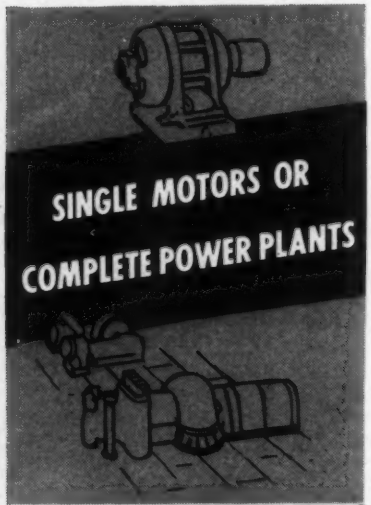
inaugurated a tree farm system under which farmers agree to maintain good forestry practices and to devote certain of their lands to timber growing.

◆

DEMONSTRATION OF DIAL SYSTEM GIVEN PRO PAPER GROUP

At the December meeting of the Chicago Professional Paper Group, held in the Chicago Bar Association, the evening of the 18th, the Illinois Bell Telephone Company gave the group a most entertaining and instructive demonstration of the dial system. The company's equipment has been worked out in such a manner as to give comprehensive knowledge of how the electric impulses set in motion by a user traces through the system, and by a succession of eliminations, automatically connects with the one selected number out of the more than a million dial phones in use in this area.

Another feature presented to the Group at this meeting was the Hercules Powder Company's color film "Careers for Cellulose." This film is among the best of industrial releases and traces the steps required to produce beautiful workable plastics from cotton linters.



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No Annual TAPPI Meeting

A late dispatch brings the announcement that the annual meeting of the Technical Association of the Pulp and Paper Industry will not be held in February. This conforms with measures being taken by the Office of Defense Transportation to relieve transportation congestion and crowded hotel accommodations. The American Paper and Pulp Association already has cancelled its regular annual meeting, and only essential committee meetings of the Association and its affiliate bodies will be held during the time usually designated as Paper Week.

The Chicago Professional Paper Group is now in its second year. Meetings have been well attended, indicating that this Group is serving a definite purpose in bringing together various branches of the industry for a better understanding of its problems.

◆

UNIVERSITY OF MAINE LUNCHEON ANNOUNCED

The fifteenth annual "Paper Week" luncheon of the University of Maine Alumni and friends will be held at the South Room of the Commodore Hotel, New York City, Wednesday, February 21, at 12:30 p. m. All Maine men are welcome, and are urged to attend this informal get-together.

Reservations may be had by addressing Walter A. Littlefield, Brown Company, 500 Fifth Avenue, New York 18, New York.

◆

MANUFACTURERS SHOW INTEREST IN PRODUCTS OF TOMORROW EXPOS.

Chicago's spacious Coliseum will be the scene next spring of the Products of Tomorrow Exposition and already there is a scramble on for space from scores of manufacturers who have their peacetime production ready for presentation.

From surveys of American business and from requests for space in the exposition three things are noticeable:

1—Television and allied fields of electronics will present a varied array of peacetime adaptations of wartime discoveries.

2—Plastics and the field of synthetics rank high in the industries readying new ideas for civilian trade.

3—Most manufacturers have their products ready for presentation and await only the word to go ahead from government agencies.

In scores of fields manufacturers have found peacetime uses for ideas which were originally thought useful only for war.

Marcus W. Hinson, chairman of the exposition planning committee, has been directing a survey of American and Mexican business interests to determine when the bulk of the industries would have their products ready for unveiling.

One of the industries showing particular interest in the exposition is the deep freeze industry.

Other branches of the huge food industry have also shown interest in the exposition.

In the field of plastics, advance inquiries indicate, will be shown the development of that science in the manufacture of hundreds of items now constructed of other material.

◆

WOOD PULP IMPORTERS RE-ELECT OFFICERS

At the annual meeting of The Association of American Wood Pulp Importers, held in New York December 14, the following officers were re-elected for the coming year:

President—A. J. Pagel
Vice president—R. G. Westad
Treasurer—B. Lindell
Secretary—A. Blattmann
Director—P. G. A. Sparre

◆

CONVENTIONS AND COMING EVENTS

January 24-26—Annual meeting of the Technical Section of the Canadian Pulp and Paper Association, Mount Royal Hotel, Montreal, Canada.

(The regular annual meetings of the American Paper and Pulp Association and the Technical Association of the Pulp and Paper Industry will not be held this year.)

March 1—First national Products of Tomorrow Exposition, Coliseum, Chicago.

STATED MEETINGS

Technical Associations of the Pulp and Paper Industry

Delaware Valley Section—First Friday of each month at the Engineers' Club, Philadelphia, Pa.

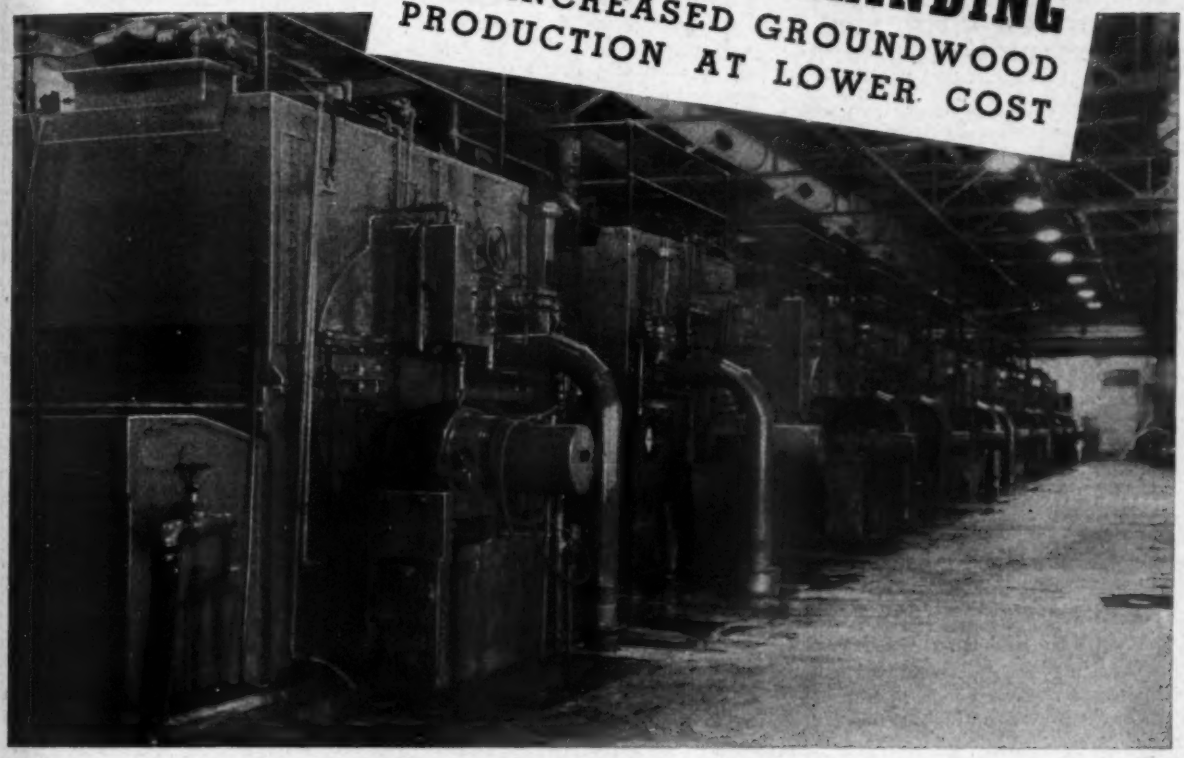
Kalamazoo Valley Section—First Thursday of each month, including June, at 6:30 P. M. at the Columbia Hotel, Kalamazoo, Mich.

Lake States Section—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

Chicago Professional Paper Group

Third Monday of each month at Chicago Bar Association, Chicago.

HIGH-SPEED GRINDING
FOR INCREASED GROUNDWOOD PRODUCTION AT LOWER COST



SAVE
up to 70% in labor with
ROBERTS GRINDERS

High-speed grinding cuts grinder room crews 50% to 70%. One operator feeds two units producing up to 100 tons of pulp in 24 hours. In one mill 11 Roberts Grinders replaced 31 pocket grinders and reduced labor requirements from 82 men to 30. Thousands of man-hours are saved annually.

HIGH-SPEED GRINDING can increase the pulp output of your present grinder room and reduce the cost per ton. Grinding pulp successfully at 5000 feet per minute has been fully demonstrated with the Roberts Grinder. Each grinder will produce 45 to 50 tons of good news grade pulp in twenty-four hours. Due to the large production with high-speed grinding fewer units are needed. One Roberts Grinder replaces three or four pocket grinders. The floor space necessary for installation is but little more than for a single 3 pocket grinder and the headroom requirements are about the same. For the same tonnage a saving of up to 50% in floor space is possible and few mill changes have to be made in substituting them for the pocket type.

HIGH-SPEED GRINDING with the Roberts Grinder is not only practical but decidedly advantageous. It provides improvements from every angle in the manufacture of groundwood pulp including more uniform consistency and better quality.

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S A F E T Y

COMMITTEE PRESENTS SAFETY PLAN FOR THE INDUSTRY TO THE APPA

Plans for safety measures in the mills of the industry were submitted by a Subcommittee on Safety to the Industrial Relations Committee of the American Paper and Pulp Association at a meeting held in New York December 12.

In releasing this announcement the APPA states this will not be a "campaign" but a sustained plan on a year-round basis. The reason for this is that a large number of companies have not become members of the National Safety Council, and in this group very little accurate data are available on actual safety measures and accomplishments which can be applied to the industry as a whole.

◆

BAY WEST PAPER CO. HONORS EMPLOYEES FOR 7½ YR. SAFETY RECORD

A dinner was given to the employees of Bay West Paper Company, Green Bay, Wisconsin, on the evening of December 14. The event was in recognition of their outstanding safety record — a total of 90 months, or 7½ years without a lost-time accident, with the record still intact.

Present at the dinner was the company's oldest employee in years of service. In 21 years George Schroeder has never experienced a lost-time accident.

Exhibited for the occasion were the company's trophies. For seven consecutive years it has won the National Safety Council award in its group in the paper industry safety contest. In the accompanying illustration, the seventh award is shown. Also the warning banner in the picture is a constant reminder of the date of the company's last lost-time accident.

◆

SAFETY SCORES

▶▶▶ PERFECT SCORES are recorded for nineteen mills at the close of November, the fifth month in the 1944-45 Paper Industry Safety Contest. The following list of mills have a perfect record:

Division I—Pulp and Paper Mills

Group A

Price Bros. & Co., Ltd., Riverbend, P. Q.

Group B

(None)

Group C

Container Corp. of America, Carthage, Ind.

Group D

Strathmore Paper Co. (Woronoco Mill No. 2), West Springfield, Mass.
Marathon Corp. (Ashland Div.).
*Central Fibre Products Co., Vincennes, Ind.
Latex Fiber Industries, Inc., Beaver Falls, N. Y.
Certain-teed Products Corp., Buffalo.
Strathmore Paper Co. (Woronoco Mill No. 1), West Springfield, Mass.
*Central Fibre Products Co., Denver.
E. I. du Pont de Nemours & Co., Newhall, Wilmington, Del.

Division II—Paper and Board Remanufacturing

The Flintkote Co., Chicago Heights Plant, Ill.
Container Corp. of America, Cleveland.
Ft. Wayne Corr. Paper Co., Chicago.
Lanzit Corrugated Box Co., Chicago.
Bird & Son, Inc. (Roofing Plant), Shreveport, La.
Thilmany Pulp & Paper Co. (Bag Mill), Kaukauna, Wis.
Iowa Fiber Box Co., Keokuk, Iowa.
Kimberly-Clark Corp. (Atlas Mill), Appleton, Wis.
Bay West Paper Co., Green Bay, Wis.

(*) November report missing.

The seventh consecutive National Safety Council award to the Bay West Paper Company, Green Bay, Wisconsin, is presented by W. J. Servotte, general manager (center), to George Schroeder (right), who is the oldest employee in years of service. At the left is J. A. Long, superintendent.

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◆

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We also manufacture cutting cylinders, anvil rolls, squeeze rolls. We make a specially constructed steam jacketed 2" and 3" pump for handling viscous materials, such as filled asphalt, heavy lubricating oils, vegetable oils, paints, etc.

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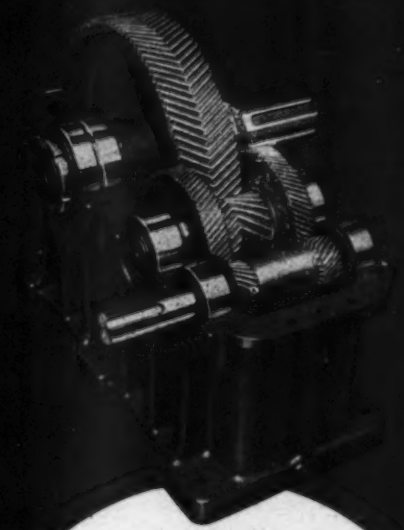
● These machines fill a long felt need for double reduction units of the fully enclosed type to be used for agitators, mixers, ore roasters, bending rolls, etc., requiring a vertical shaft drive. Built in standard ratios in various types of assemblies ranging from 40 to 1 to 250 to 1 for all common motor speeds and a wide range of horsepower ratings. Jones Bulletin No 75 covers complete details.



JONES HERRINGBONE SPEED REDUCERS

● Jones Herringbone Speed Reducers are built in single, double and triple reduction types with a large range of ratios and ratings making it possible to fulfill all ordinary requirements by the selection of standard units.

All these reducers have heat treated gears, ground shafts and are mounted with anti-friction bearings throughout.

Catalog No. 70 contains 128 pages of detailed information on the application of these speed reducers.

"JONES DRIVES FOR INDUSTRY"

is the title of a 16-page bulletin that may be helpful in giving you a broad picture of the Jones products, engineering services and manufacturing facilities that are available.

Just ask for Bulletin No. 80

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PILLOW BLOCKS ● FRICTION CLUTCHES ● TRANSMISSION APPLIANCES

NAMES *in the* NEWS

Personals

A PAPER MILL CHEMIST TRAINS CHINESE UNITS IN CHEMICAL WARFARE

EDITOR'S NOTE: The following item is reproduced here exactly as it was received from the China-Burma-India theatre. The Press Censor's stamp bore the date November 28, 1944.

Y-Force Operations Staff, China Theater — Staff Sergeant LeRoy L. New, 26, of Dexter, N. Y., formerly assistant chemist with the Dexter Sulphite Pulp & Paper Company, has for the past year, been on duty as assistant to the Chemical Officer of Y-Force Operations Staff, the world's largest military mission.

Y-Force, under the leadership of Brigadier General Frank Dorn, of San Francisco, Calif., has been putting into effect its mission of improving the combat efficiency of the Chinese Expeditionary Force by training them in modern battle tactics and in the use of weapons furnished them by the United States.

When this training was finished, infantry, signal, medical, engineer, chemical warfare, veterinary, ordnance and artillery personnel of Y-Force worked in liaison with the CEF in its Salween River Campaign, the first offensive launched by the Chinese in the seven long years they have been fighting the Japanese, to drive the Japs from Western Yunnan Province.

This drive has now cleared the Burma Road west of the Salween from Jap domination, making a link with the Ledo Road being forced through the jungles of North Burma possible, thus giving China a much-needed land supply line.

Sergeant New has been responsible for much of the chemical warfare training given to the Chinese. The Chinese soldiers successfully used the flamethrower, on which weapon chemical warfare personnel spent much time in instruction, to reduce well-fortified and deeply-dug-in Jap positions on the steep sides of the Kaoli Kung Mountain Range west of the Salween.

He entered the Army on February 19, 1942, received his basic training at Edgewood Arsenal, Md., and was assigned to the Post Chemical Office at Camp Pickett, Va. There he handled supply of gas masks and other chemical equipment, and trained units in the care and use of this materiel.

New was ordered overseas from Edgewood Arsenal and arrived in India in October, 1943. Soon after, he was assigned to Y-Force Operations Staff and flown over the Himalayan "Hump" into China.

This part of China is one of the most primitive and isolated sections of the world, with the only means of access to the outside world, until the Ledo-Burma Road is opened, being the lofty "Hump" route of the Army's Air Transport Command.

Although there are a few automobiles and trucks in Southwest China, the principal methods of transportation are two-wheeled, rubber-tired, horse-drawn carts and the well-known ricksha.

Sergeant New's wife, Virginia, and 18-month-old son, William, live in Dexter, as does his mother, Mrs. Estella New.

For his service with Y-Force, Sergeant New is entitled to wear a bronze star on his Asiatic Pacific campaign ribbon.

Sergeant New at work somewhere in China.

◆

PERKIN MEDAL IS PRESENTED TO DR. ELMER K. BOLTON

At a dinner meeting of the American Section of the Society of Chemical Industry, held at the Commodore Hotel, New York City, January 5, special presentation of the Perkin Medal was made. The medalist receiving this award was Dr. Elmer K. Bolton, chemical director of E. I. du Pont de Nemours & Company, Wilmington, Delaware.

Dr. Bolton is the 39th member of the group of distinguished chemists to receive this medal. Since receiving his doctorate from Harvard, Dr. Bolton has won many honors. He has been associated with the Du Pont company since 1915 and has achieved special honor for his work in dyes and pigments. He was made assistant chemical director of the company in 1929 and became Chemical Director in 1930.

In 1941, Dr. Bolton received the Chemical Industry Medal which is awarded annually by the American Section of the Society of Chemical Industry, "for valuable application of chemical research to industry."

◆

DR. SUITS MADE A VICE PRESIDENT OF G-E CO.

A new vice president of General Electric Company, Schenectady, New York, is Dr. C. G. Suits, who since 1940 has been assistant to the director of the research laboratory. In his new position, Dr. Suits will be in charge of the company's research, succeeding Dr. W. D. Coolidge, who retired as vice president and director of the research laboratory on December 31.

Dr. Suits ranks among the youngest

Draper's

ATLAS OF AMERICAN PAPERMAKING

No. 1 PUBLISHED BY DRAPER BROTHERS COMPANY • CANTON, MASSACHUSETTS

Map copyright by L. D. Post, Inc., New York. American Map Co., N. Y.

HIGH LIGHTS: The first paper mill in Massachusetts was established in Milton, Massachusetts, near the mouth of the Neponset River, by Daniel Henchman in 1728.

The first American mill to make ground wood pulp was erected in the town of Stockbridge in 1866, and its output was used at Lee.

The great dam across the Connecticut River at Holyoke was built in 1847, and the first paper mill began operations there in 1853.

Massachusetts ranks 12th in paper production. It has 89 paper mills and 3 pulp mills; 134 Fourdrinier machines, 37 cylinder machines, 5 Yankee machines and 21 wet machines. Principal products are fine papers, book paper, and bristol board.

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DRAPER BROTHERS COMPANY

Woolen Manufacturers Since 1856

Canton, Massachusetts

RALPH E. BRIGGS Sales Manager

BRADFORD WEST PITTSFIELD, MASS. • WILLIAM N. CONNOR Jr CANTON, MASS. • L. H. BREYFOGLE KALAMAZOO, MICH. • CHAS. E. BERTSCHY MILWAUKEE, WIS. • W. L. CAMPBELL SAVANNAH, GA. • BALFOUR GUTHRIE & CO. Ltd. PACIFIC COAST

of the country's prominent scientists. He graduated from the University of Wisconsin in 1927 and became a member of the G-E laboratory staff in 1930. He is especially known for his research in high-temperature arcs.

◆

▶▶▶ In addition to his duties as comptroller of the Reliance Electric & Engineering Company, Cleveland, *P. G. McAusland* has been elected treasurer.

P. G. McAusland

In his enlarged responsibilities, Mr. McAusland succeeds H. M. Hitchcock, who retired December 31.

◆

▶▶▶ Elected to the Board of the Netherlands Chamber of Commerce in New York for a three-year term is *Dr. Theodore M. Switz,* director of Hercules Powder Company's Export Department. Dr. Switz is a graduate of Lehigh University and the Royal College of Science, University of London. He is a director of the Inter-American Commercial Arbitration Association, a member of the Export Managers Club, and of the Council on Foreign Relations, New York City. He has been associated with Hercules since 1937, and was made director of the Export Department in June, 1941.

◆

▶▶▶ *Neville Beaton* has resigned from Wartime Shipbuilding, Ltd., with which company he occupied the position of division manager for the Quebec and Maritime areas, and has joined the Marathon Paper Mills of Canada, Ltd., as assistant to the vice president. Mr. Beaton was resident engineer with Powell River Company, Ltd., Powell River, British Columbia, prior to joining Wartime Shipbuilding, Ltd.

▶▶▶ The election of new officers is announced by the Permutit Company, of New York. *W. Spencer Robertson,*

W. Spencer Robertson

who has been president of the company for the past fifteen years, becomes chairman of the board. He is succeeded in the presidency by *Henry*

Henry W. Foulds

W. Foulds, executive vice president since 1935. Prior to that time, Mr. Foulds had been a vice president and director of Goulds Pumps, Inc.

◆

EXECUTIVE CHANGES AT WORTHINGTON PUMP

At its December meeting, the board of directors of Worthington Pump and Machinery Corporation, Harrison, New Jersey, elected Clarence E. Searle president of the corporation to succeed Harry C. Beaver who was elected vice chairman of the board of directors, and chairman of Management Committee.

Mr. Beaver has been president of the corporation since 1931, and Mr. Searle has been vice president in charge of sales since joining the Worthington organization in 1932, following a long period of service in various capacities with the Allis-Chalmers Manufacturing Company of Milwaukee, Wisconsin.

Clarence E. Searle

Other appointments by the board were: Hobart C. Ramsey, who has been vice president in charge of operations, was elected executive vice president; Edwin J. Schwanhausser, vice president in charge of manufacturing and sales operations in Buffalo, was elected vice president in charge of sales. Leslie C. Ricketts, manager of the Harrison works, was elected a vice president.

◆

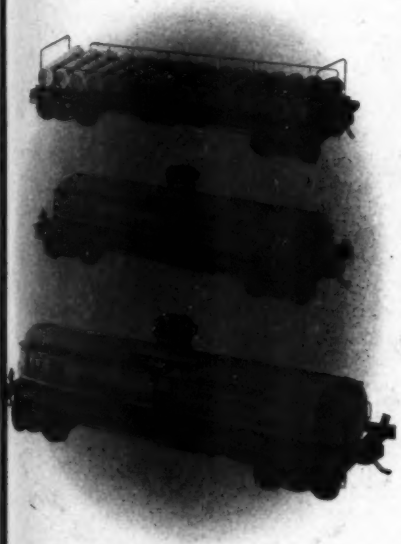
▶▶▶ The manager of Hercules Powder Company's detonator operations, *Kurt W. Jappe,* has been appointed treasurer of the American Society of Mechanical Engineers, succeeding Dr. William D. Ennis, who retired December 31 after holding office since 1936.

◆

▶▶▶ *David C. Prince,* vice president of General Electric Company, Schenectady, New York, has taken charge of the company's General Engineering Laboratory, the activities of which will be broadened to include the requirements of the entire company. This change from the responsibilities of application engineering for the Apparatus Department became effective January 1. Mr. Prince also has been chairman of the company's special planning committee.

ALKALI

DIAMOND LIQUID CHLORINE



THE DEPENDABLE CHLORINE SPECIFICATION FOR PROCESSING ENGINEERS THE YEAR 'ROUND

DEPENDABLE

UNIFORM

SAFE

WM. K. KIDDER MADE VICE PRES. OF NATION WIDE PAPERS, INC.

Announcement is made by Nation Wide Papers, Inc., of the election of William K. Kidder as its vice president and general manager, effective December 1, 1944.

Mr. Kidder recently retired from the position of Regional Paper Commodity Specialist with the Chicago Regional Office of the Office of Price Administration.

Mr. Kidder's experience in the paper industry dates from 1925 following his graduation as a Chemical Engineer from the University of Michigan, when he was engaged by the Allied Paper Mills at Kalamazoo as a chemist in its general laboratory. In 1927, he was promoted to be chief chemist and remained in that capacity until 1932 when he was employed by Oxford Paper Company as technical superintendent of the coating division at Rumford, Maine. In 1936, he returned to Kalamazoo as director of research and sales service representative for the Bryant Paper Company, remaining in this capacity until 1942, when he entered the government service.

Nation Wide Papers, Inc., has opened a Chicago office in the Conway Building (111 W. Washington St.), where Mr. Kidder will direct its sales and merchandising activities.

◆

▶▶▶ W. G. MacNaughton, News Print Service Bureau, New York City, has been notified that his second son, *2nd Lieutenant Peter L. MacNaughton,* has been promoted to first lieutenant. At present, Lieutenant MacNaughton is in McCloskey General Hospital, Temple, Texas, recovering from injuries sustained in an aircraft accident last September. Previous to enlisting, the Lieutenant was employed by International Paper Company, Panama City, Florida.

◆

LOU BOUDREAU JOINS PERSONNEL DEPT. OF WHITING CORP.

The personnel department of Whiting Corporation, Harvey, Illinois, has a new staff member. Macon Miller, personnel director of the company, announces that Lou Boudreau, playing manager of the Cleveland Indians, has joined the staff and will direct his efforts toward obtaining additional manpower for the war effort.

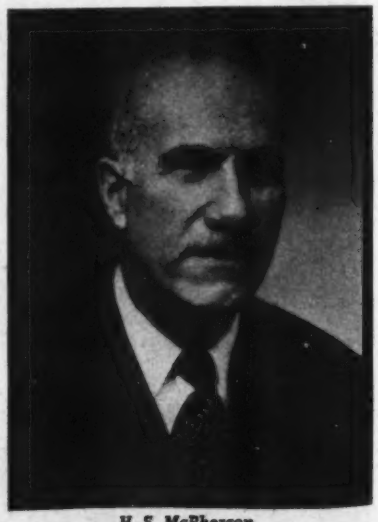
The Whiting Corporation, doing all-out war work, has just recently celebrated its sixtieth year of service to industry. It has felt the manpower shortage keenly as have all industries. Mr. Boudreau will also assist in arranging a complete recreational program for the morale of his fellow war workers.

◆

U. S. RUBBER APPOINTS TWO NEW SALES MGRS.

The U. S. Rubber Company, New York City, has appointed H. S. McPherson, of St. Louis, Missouri, midwestern sales manager of the mechanical goods division. His territory includes Detroit, Cincinnati, Indianapolis, Chicago, Milwaukee, and St. Louis.

Another appointment is that of W. M. Ballew, of Kansas City, Missouri, who has been made southwestern sales manager. He will be responsible for mechanical goods sales in branch offices in Kansas City, Tulsa, Denver, Houston, Dallas, New Orleans, Omaha, and Minneapolis.



H. S. McPherson

W. M. Ballew

LUNKENHEIMER COMPANY ANNOUNCES CHANGES

Changes in executive personnel of The Lunkenheimer Company, Cincinnati, Ohio, have been announced as follows:

Frank P. Rhame, a director, vice president, and assistant general manager, succeeds Charles A. Brown, who retired December 31. Mr. Rhame has been with the company for over 25 years. Homer E. Lunken, a director, succeeds him as assistant general manager.

Carra L. Lane, a production man of wide experience in valves and related products, has been named works manager, succeeding George A. Seyler, who retired as vice president December 31.

Fred H. Hehemann, assistant chief engineer, becomes chief engineer, succeeding Jerome J. Aull, who retired December 31 after nearly 50 years of service with The Lunkenheimer Company. Mr. Hehemann has been with the company since 1904.

Harry A. Burdorf, widely known in the valves and fittings industry and distributive channels, remains as a director and vice president in charge of sales.

Eshelby F. Lunken remains a director and president of the company; Chester C. Isekeit as a director and treasurer; and Charles W. Burrage as secretary.

◆

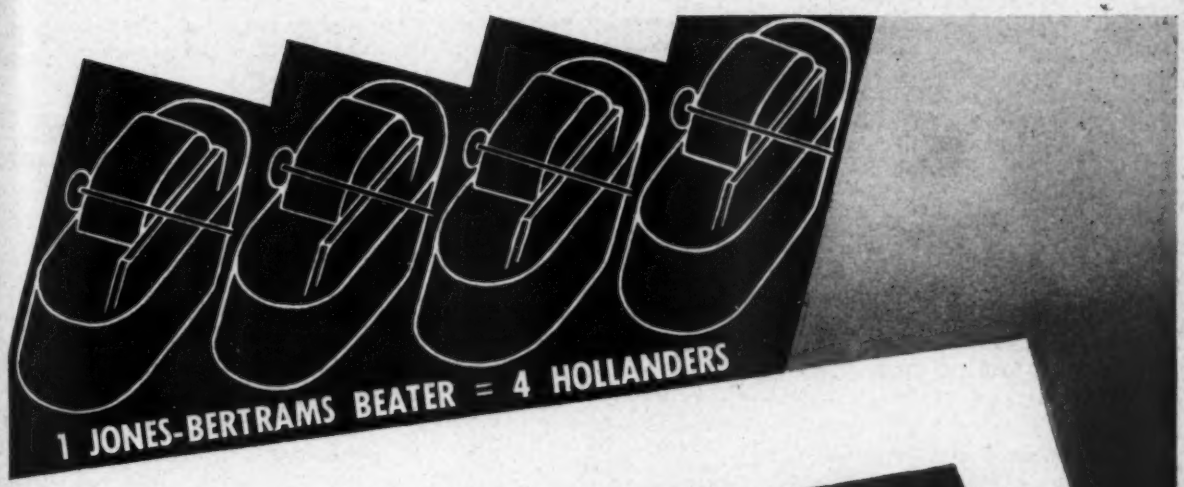
▶▶▶ The highest award yet given by the Labor-Management Suggestion Committee of the Powell River Company at its pulp and paper mills, Powell River, British Columbia, was made recently when *Alex Morris* received $500 for his suggested improvement to the paper-strip carrying roll on the newsprint machines. It is said that Morris' idea has resulted in a considerable saving in production, as well as doing away with trouble experienced in this particular phase of the operations.

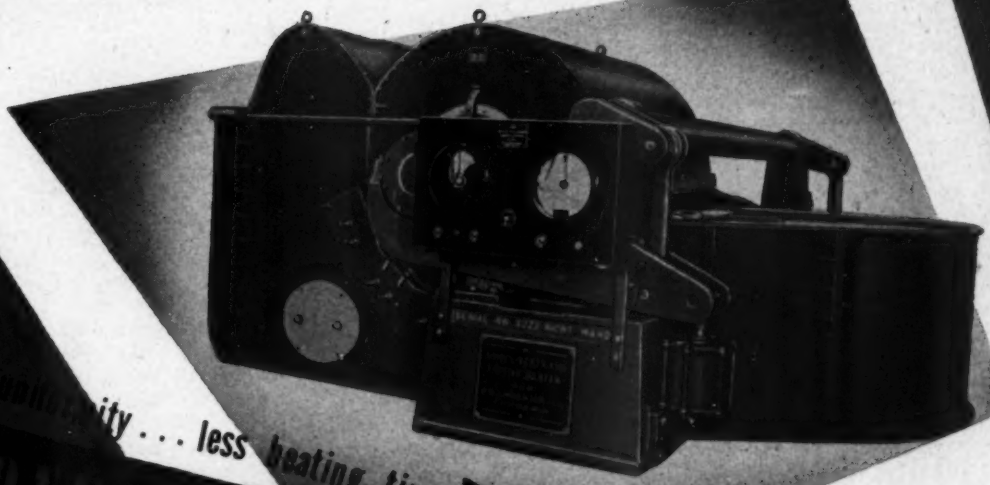
◆

DR. WEIDNER LEAVES HOBERG FOR POSITION WITH CONTAINER CORP.

On January 1, Dr. John P. Weidner, formerly technical director of the Hoberg Paper Mills, Green Bay, Wisconsin, became associated with the Container Corporation of America as technical assistant to the manager of its Manayunk mill, near Philadelphia. In his new connection, Dr. Weidner will be in control of research development and paper quality.

Dr. Weidner has been with the





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Jones

GEARED FOR WAR PRODUCTION

E.D. JONES & SONS COMPANY-PITTSFIELD, MASS.

Builders of Quality Machinery for Paper Mills

Hoberg company since receiving his Ph. D. in paper chemistry at the Institute of Paper Chemistry in Appleton, Wisconsin. He established the company's present research department, of which he became director. In 1940 the Research and Control Departments were combined and he was given complete charge of this new department as technical director.

◆

HAROLD W. KEPHART IS NOW ASSOCIATED WITH BULKLEY, DUNTON

Head of the newly set up Foil and Packaging Division of the Bulkley, Dunton Organization, New York City, is Harold W. Kephart, formerly assistant vice president of Reynolds Metals Company.

Mr. Kephart will work with Jack Wilson, head of the company's Specialty Papers Division. He will concentrate his efforts on the development and promotion of packaging materials, including that produced by the recently perfected method of casting protective films onto paper or foil. He is well known in packaging circles and is considered to be one of the experts in the field.

◆

▶▶▶ The appointment of *Harry R. Kluth* as general manager of the Pittsburgh Plate Glass Company's 77 warehouses was effective January 1. Mr. Kluth succeeds *Frank Clarke,* who moves to Brooklyn as warehouse manager and Eastern manager. He has been connected with the company's Philadelphia branch for the past 35 years. In 1935 he was made manager, and a year later district manager.

◆

▶▶▶ *John R. Rogers* has been appointed to the Board of Directors of the J. & J. Rogers Company, Au Sable Forks, New York, to fill the vacancy caused by the passing of Robert Caldwell. *James Rogers II* was elected vice president and general superintendent and *C. D. Cameron,* vice president and secretary-treasurer. *John R. Rogers* has been made paper mill superintendent and *Paul J. Beattie,* sulphite mill superintendent.

◆

▶▶▶ The Newton Paper Company, Holyoke, Massachusetts, announces the appointment of *Edward A. Ezold* as assistant treasurer. Mr. Ezold has been with the company for fifteen years. To succeed the late Frank H. Knoll as New York sales representative, the company announces the appointment of *William H. Goodrich.*

▶▶▶ Since 1930 *Dr. Franklin D. Smith* has been associated with the Monsanto Chemical Company, St. Louis, Missouri. Dr. Smith has just been appointed assistant director of development for the company's organic chemicals division. From research chemist he became a member of the company's technical service department staff in 1932, and has been on the staff of the divisional development department since 1943, specializing in organic chemical problems.

◆

▶▶▶ New vice presidents of Rayonier, Inc., are *William E. Breitenbach* and *Martin N. Deggeller,* of Port Angeles and Olympia (Wash.), respectively. Mr. Breitenbach, who is resident manager of the Port Angeles mill, will be superintendent of Northwest mills, and Mr. Deggeller, who has been woodlands manager in the Port Angeles area, will have charge of all timber operations.

◆

▶▶▶ Now in full charge of all Blackmer Pump Company operations is *Fred T. Kennedy,* who has been appointed general manager of the company. Until recently, he has been connected with the WPB, but he now has taken up residence at Grand Rapids, Michigan; he will have his headquarters at the main office there.

◆

PENN SALT PROMOTES EDMUND A. GEORGI

The appointment of Edmund A. Georgi as Director of its Special Products Division of its Research and Development Department has been announced by Pennsylvania Salt Manufacturing Company, Philadelphia.

Mr. Georgi was formerly manager of technical development of the Papermakers Chemical Department, Hercules Powder Company. The Special Products Division includes laboratory and field work in evaluation of new products, and in carrying out service work requested by the Sales and Manufacturing Departments.

◆

▶▶▶ Pacific Mills, Ltd., of Vancouver and Ocean Falls, British Columbia, have announced the appointment of *C. R. Matheson,* graduate forester of the University of British Columbia to its recently organized forestry department. Timber operations of the company are being placed on a managed basis to assure sustained yield. Work of the new department will include wood utilization, studies on timber growth, sylviculture and sustained yield planning. Head of the department is *Hugh Hodgins,* University of British Columbia graduate, who has been sixteen years with the forest branch.

◆

D. M. SHAPLEIGH NOW WITH PAPER & IND. APP.

Paper & Industrial Appliances, Inc., New York City, announces the appointment of D. M. Shapleigh as director of technical sales.

Mr. Shapleigh has had a broad experience in the pulp and paper industry, being formerly associated, over a long period of years, with prominent firms in the industry: American Bewoid Division of Bulkley-Dunton Pulp Company, Inc., papermakers; chemical division of Hercules Powder Co., American Delthirna, Inc., and technical sales pulp division of Brown Company.

Mr. Shapleigh's activities will be devoted to technical sales and services for all P&I products, including the Defibrator-Chemipulper, Roll-O-Finer, Brammer Control, and Smith-Eagan Beater.

◆

▶▶▶ Twenty-eight years ago *William Barclay* entered the service of Powell River Company, Powell River and Vancouver, British Columbia, as a junior clerk. Advancing through various positions, he was recently appointed as vice president of Powell River Sales Company. Mr. Barclay assisted in the organization of the Sales Company and in 1937 became its general manager.

◆

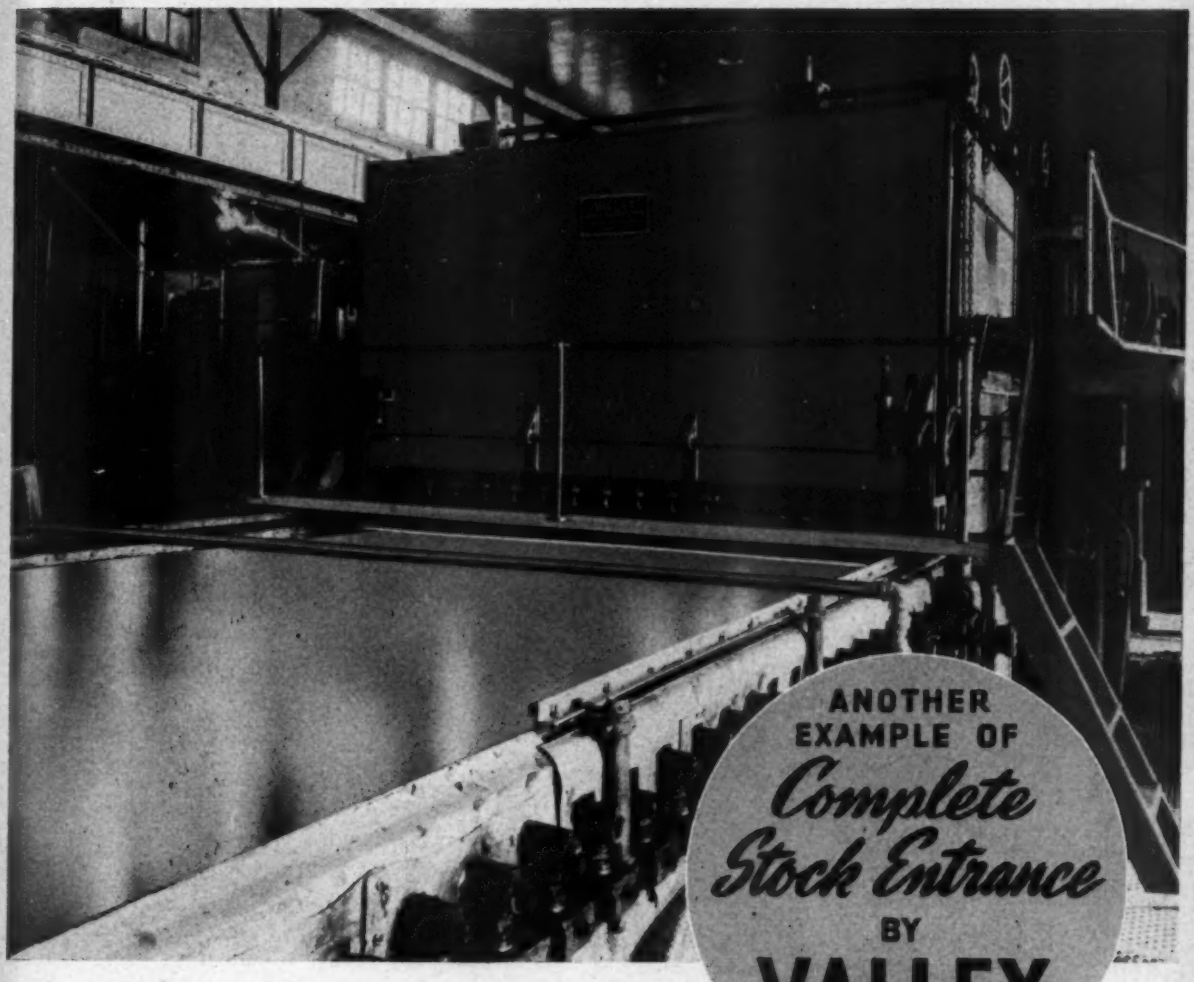
▶▶▶ Completing forty-eight years of service with Standard Oil Company (Indiana), *Amos Ball,* vice president in charge of sales and a director, retired on January 1. *Roy F. McConnell,* now general manager of sales, will move into the vice presidency, and *H. E. Hanson,* now ranking assistant general manager, will become the general manager of sales.

◆

CLARENCE O'NEAL NOW SOLE OWNER OF THE ROBERTSON COMPANY

The three tissue paper mills of the Robertson Company, Hinsdale, New Hampshire, are now personally owned by Clarence B. O'Neal, who has served as treasurer of the firm. Frank W. Jeffords, president, has sold to Mr. O'Neal his half interest in the property.

Mr. O'Neal has been associated with the company since 1916; Mr. Jeffords since 1918. In 1929 they purchased the entire capital stock of the Robertson Company as equal owners.



SIMPLICITY IN DISGUISE

•

The simplicity of exterior design of this Headbox and Inlet Combination on Sorg Paper Company's No. 6 machine is merely a matter of good engineering—but the ingenious operating mechanisms and precision adjustments *behind* this plain-looking exterior are possible only as the product of fine machine work and technical know-how. The sum total is—*peak, paper-making efficiency.*

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Slices and Head Boxes • Screw Presses • Micro-Mist Spray Dampeners • Laboratory Equipment
Pulp Washing Systems • High-Speed Beaters • Breaker Beaters • Vortex Beaters • Plug Valves
Flat and Rotary Screens • Thickeners • Deckers • Paper Markers • Roll-Headers

Necrology

COL. H. MAXWELL HOWARD

Nationally prominent, the head of three paper mills, Colonel H. Maxwell Howard passed away at his home in Miami Beach, Florida, on December 31 following a short illness. He was 77 years old.

Colonel Howard was president of the Aetna, Howard, and Maxwell Paper Companies and the affiliated Dayton Envelope Company. He began his career in the paper industry in 1897 when he assumed the managership of the Aetna Paper Company, Dayton, Ohio, in which he and his father-in-law had become interested. That beginning was expanded from what then was a relatively small property into today's group of Howard mills.

Colonel Howard was born in Kentucky, and typified the traditional "Kentucky gentleman." He was nationally known as a turfman; his stables housed several horses which won for him turf honors.

◆

OGDEN MINTON

Ogden Minton, inventor of the Minton vacuum dryer used in the manufacture of pulp paper, passed away December 26 at his home in New York City.

Born in Brooklyn, Mr. Minton was graduated from Cornell University with degrees in mechanical and electrical engineering. He was associated as an engineer with paper manufacturers until the early 1920's when he introduced his invention to supplant open drying equipment. He owned the Minton Vacuum Dryer Company, a licensing corporation. Since 1939 he also was a consulting engineer with the Birds Eye laboratories of the General Foods Corporation, Hoboken, N. J.

Surviving are two daughters.

◆

HENRIK GRINSTAD

Well known throughout Canada in the pulp and paper industry, and recognized as an outstanding authority on sulphite pulp, Henrik Grinstad passed away in Montreal on December 22 at the age of 56.

Born in Skatval, Norway, Mr. Grinstad received his education in Norway, graduating from university as a chemical engineer, and later taking post-graduate work in pulp and paper engineering. He came to America over a quarter of a century ago, settling first in the United States and later going to Ocean Falls, British Columbia. Mr. Grinstad had been general superintendent of the Brompton Pulp and Paper Company, Ltd., for the past twenty-three years. Last summer he left that company to go into the construction business and was instrumental in organizing the Harold S. Kerr Company, Ltd., of which he became president.

He is survived by his widow and two daughters.

◆

HOWARD McW. WYLIE

On Christmas Day, Howard McWilliam Wylie, former vice president in charge of sales of the Nash Engineering Company, South Norwalk, Connecticut, passed away at the age of 59.

Mr. Wylie became associated with Nash Engineering Company as a sales engineer at the New York office.

Howard McWilliam Wylie

Later, he became manager of that office and in 1919 went to South Norwalk as general sales manager. He was elected a director in 1921, assistant secretary in 1922, and vice president in charge of sales the next year. He retired as vice president and director in 1942. Mr. Wylie was a member of the American Society of Mechanical Engineers and the American Society of Heating and Ventilating Engineers.

He is survived by his widow and a daughter.

◆

▶▶▶ The president of H. Waterbury and Sons Company, Oriskany, New York, *James Edwin Waterbury*, passed away December 12.

SEYMOUR J. FISHER

General superintendent of the Riverbend (Quebec) plant of Price Bros. & Company, Ltd., Seymour J. Fisher passed away a few days before Christmas. He was sixty-four years of age.

Mr. Fisher graduated from McGill University, with honors and the British Association Medal in mechanical engineering. For several years he was sales and service engineer with Babcock and Wilcox.

In 1922, Mr. Fisher entered the pulp and paper industry. For four years he was engineer and woods superintendent of the E. B. Eddy Company, at Hull, Quebec. Later he served for six years as engineer and operating manager with the Lake St. John Power and Paper Company, Dolbeau, Quebec. In 1931 he became general superintendent of the Riverbend plant. He was a member of the Technical Section of the Canadian Pulp and Paper Association, the Engineering Institute of Canada, and the Corporation of Professional Engineers of the Province of Quebec.

◆

ROBERT CALDWELL

Vice president of the J. & J. Rogers Company, Au Sable Forks, New York, passed away suddenly at his home in Au Sable Forks December 17, at the age of 57.

Robert Caldwell was born in Glasgow, Scotland. At the age of five he came with his parents to Cornwall, Ontario. In 1904, he accompanied his family to Au Sable Forks where he obtained employment in the office of the J. & J. Rogers Company. He became assistant superintendent of the paper mill, and in 1931 was made superintendent and was elected to the board of directors. In 1934, he became vice president, and has been active in the business until a few weeks ago.

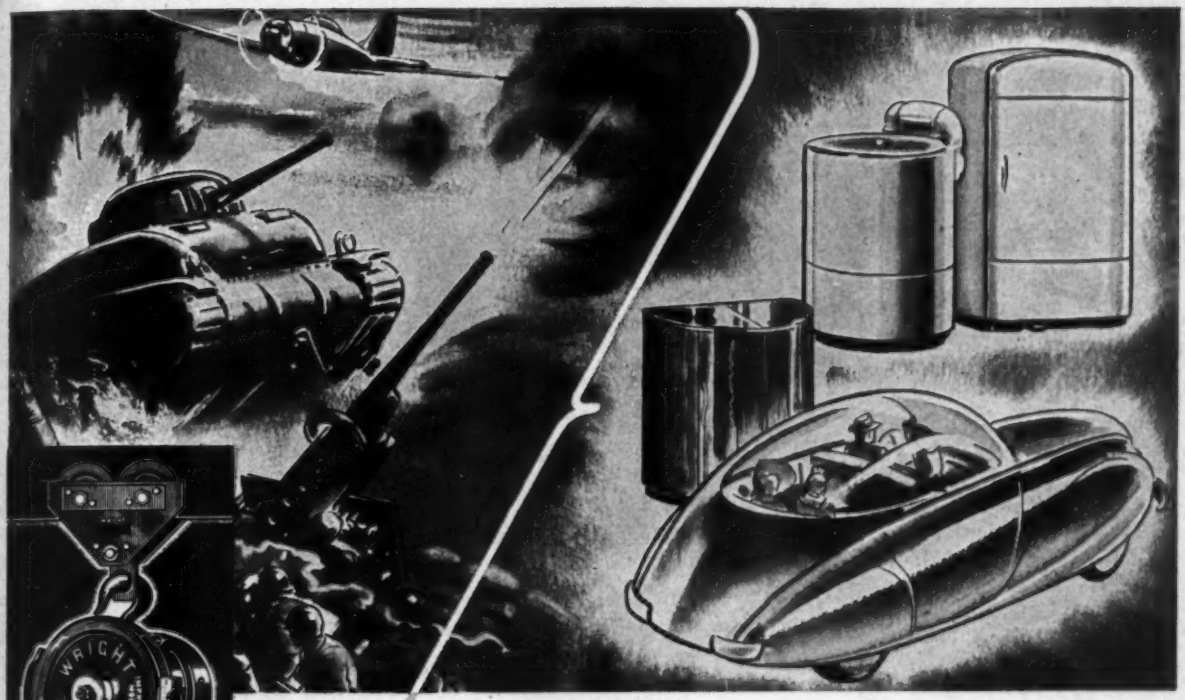
He is survived by three daughters.

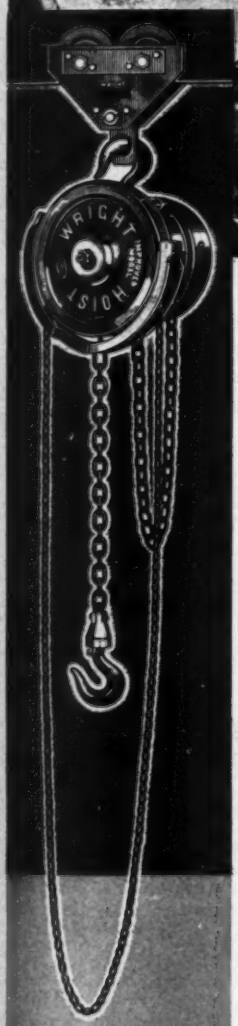
◆

CHARLES ADDOMS

A former treasurer of the National Paper Trade Association passed away December 26 after a brief illness. Charles Addoms was chairman of the board of directors of the Miller & Wright Paper Company, New York, wholesale paper concern with which he was affiliated for 50 years. He was 75 years of age.

Born in San Francisco, Mr. Addoms became associated with the Miller and Wright concern as an accountant in 1894, when it was called Miller, Sloan & Wright. He subsequently held various offices with the company, including those of president, vice president and





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CLAYTON
REMOTE
CONTROL

Instant operation is provided by the Clayton Remote Control Pilot. In unit with Clayton Valves, it permits location of the control itself for convenience of the operator... while the valve or combination of valves are located wherever required in the line. Valves are opened and closed as easily as flipping a light switch. Units or groups of valves may be controlled by a single Clayton Pilot... actuated manually, by solenoid or by float mechanisms. Illustration shows Manual Pilot.

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VALVE DIVISION
CLAYTON
"Feather Touch" CONTROL

CLAYTON MANUFACTURING COMPANY, ALHAMBRA, CALIFORNIA

treasurer, before becoming board chairman recently.

He served as treasurer of the National Paper Trade Association in 1927-36, and also was a former president of the Paper Association of New York City.

Surviving are his widow, a son, and two daughters.

◆

CHARLES N. BICKNELL

A charter member and past president of the National Paper Trade Association, Charles N. Bicknell passed away suddenly on Christmas Day in Palm Beach, Florida, at the age of seventy-three.

Mr. Bicknell was for many years associated with the Union Paper & Twine Company in Cleveland. He was treasurer and general manager of the company until 1936 and later was made vice president.

He is survived by his widow.

◆

▶▶▶ *Charles James Kittredge,* assistant treasurer of Crane & Company, Dalton, Massachusetts, passed away December 13 at the age of 51. He had been with the company for 25 years.

◆

▶▶▶ Factory manager of Buffalo Forge Company, *Don R. Marsh,* passed away suddenly at his home December 21. He was 63 years of age. Mr. Marsh started to work for the company in 1910 as a cost accountant. Successively, he was head of Cost Department, Production Manager and Factory Manager. He was a director of the Buffalo Forge Company and of the Canadian Blower & Forge Company, Ltd., Kitchener, Ontario.

◆

GEORGE WHITESLEY COGGESHALL

Noted chemist and research director for S. D. Warren Company, Boston, Massachusetts, George Whiteley Coggeshall passed away November 18. He maintained residences in Cambridge, Massachusetts, and Prince's Point, Yarmouth, Maine. Mr. Coggeshall was 76 years of age.

He served as chief chemical engineer of the Institute of Industrial Research, Washington, from 1911 to 1923, and director of the Industrial Research Laboratories in Washington from 1923 to 1929. He developed various chemical processes, including Portland cement, rare metal compounds, gasoline from heavy oils, phosphates, paper-pulp and paper specialties. He also had done special work in the propagation of roses.

New DURACITE ALKALI AND ACID-RESISTANT CEMENT

TYPE Furane-base resin cement, resistant to most inorganic acids, organic acids, alkalies of any degree of concentration, oils and solvents. High compressive and tensile strength. Temperature range to 350° F. or 375° F.

Duracite — a synthetic resin cement based on the Duralon series of synthetic resins — is characterized by extreme density, high compressive and tensile strength, and excellent resistance to acids, alkalies, hydrocarbons and solvents. It can be used as a mortar for acid-proof masonry in tank linings, floors, sewers, towers, and for other installations handling alternately acids and alkalies. It is recommended for use up to a temperature of 350° F. although Duracite may be used in some instances at temperatures as high as 375° F.

Duracite comes in the form of a liquid and powder, and unlike synthetic cements of the phenolic type, can be stored indefinitely before mixing without deterioration. Duracite is 100% resin with no solvents added. Viscosity of the Duracite solution is thus absolutely uniform, assuring uniform mixing, uniform results. Duracite is of the quick-setting type — being usable for about 30 minutes at a temperature of 70° F. The bricklayer does not have to slow down for successive courses of brick waiting for the lower courses to harden sufficiently to stay in place. Setting time, however, can be controlled to suit the individual job. Duracite is tough, durable, easy to use. It is highly resistant to abrasion, to impact shock, and to rapid changes in temperature.

POROSITY:

Duracite is extremely dense and impermeable. Absorption is less than ½ of 1%, approximately 1/25th of the best silicate type cements and substantially less than most other resinous cements. And, unlike resinous cements of the phenolic type whose porosity increases with age and temperature Duracite's dense, non-porous structure is permanent, remaining virtually the same, and completely impermeable, even at elevated temperatures.

DURACITE IS NON-TOXIC:

Duracite is non-toxic, has no dangerous effect on the skin. No explosive or inflammable hazard. Only normal precautions are required in handling.

CHEMICAL RESISTANCE:

Duracite is inert to *all* acids with the exception of high concentrations of highly oxidizing acids such as nitric and chromic. Laboratory tests indicate that Duracite will handle satisfactorily mild concentrations of nitric and chromic, but such applications should be approached with caution as they are definitely border-line cases. Duracite is inert to *all* alkalies, *all* fats, oils and solvents. Duracite may be used where equipment is required to handle strong acids and alkalies alternately. Duracite is likewise inert to fresh or salt water, or steam.

The table showing resistance characteristics of Duracite is based on laboratory and field experience over approximately a three-year period. It is offered as a guide only and should not be considered as an expressed or implied guarantee. In the case of solutions marked "requires special consideration" it is suggested that full details be sent to U. S. Stoneware's Process Equipment Division for their consideration and suggestions.

Physical Properties and Technical Data:

Absorption: Less than ½ of 1% ASTM tests.

Compressive Strength: 12,000 lbs. sq. in.

Tensile Strength: Over 1,400 lbs. sq. in.

Modulus of Rupture: 1,500 lbs. sq. in. (fully cured).

Coefficient of Expansion: Mean Linear Co-efficient of Thermal Expansion, per degree F. —14.4x10, at a temperature range of 68° F. to 350° F.

Adhesion: Excellent to acid brick, tile, and other non-metallic materials. Approximately 4-5 times that of silicate type cements.

Setting Time: Duracite takes an initial set within 20-30 minutes at room temperature. May be placed in service within 2 to 3 days after the last brick is laid. Curing time varies with temperature.

Joint Thickness: 1/16" to 1/8".

Weight: 1 cubic foot of mortar weighs 90-92 lbs.

Amount Required: Approximately ½ lb. of mortar per 9" brick, buttered 3 sides.

Color: Black.

Shipping Units: 50 lbs., 125 lbs., 500 lbs.

CHEMICAL RESISTANCE OF DURACITE CEMENT:

1. Quite satisfactory

Acetic acid, all concentrations including glacial
Acetic anhydride
Acetaldehyde
Acetone
Aluminum chloride solutions
Aluminum sulphate solutions
Ammonium hydroxide, all concentrations
Ammonium carbonate solutions
Ammonium chloride solutions
Ammonium fluoride solutions
Ammonium phosphate solutions
Ammonium sulphate solutions
Aniline
Barium hydroxide solutions
Benzene
Benzine
Benzoyl chloride
Bleach solutions, most but not all
Boric acid solutions
Calcium hydroxide solutions
Carbon bisulphide
Carbon tetrachloride
Chloride of lime
Chloroform
Citric acid solutions
Cocoanut oil
Copper sulphate
Ethyl acetate
Ethyl alcohol
Ethyl ether
Ferric chloride solutions
Ferric sulphate solutions
Formaldehyde
Formic acid
Gasoline
Glycerine
Hydrochloric acid, all concentrations
Hydrofluoric acid, all concentrations
Hydrogen sulphide solutions
Iodine in potassium iodide solution
Lactic acid, all concentrations
Magnesium chloride solutions
Maleic acid
Methyl alcohol
Nickel chloride solutions
Nickel sulphate solutions
Oleic acid
Oxalic acid solutions
Petroleum ether
Phenol solutions
Phosporic acid, all concentrations
Potassium hydroxide, all concentrations
Sodium hydroxide, all concentrations
Sodium carbonate solutions
Sodium sulphide solutions
Stearic acid solutions
Sulphuric acid up to 1.5 sp. gr.
Sulphurous acid, all concentrations
Sulphur monochloride
Trichlorethylene
Toluene
Xylene
Zinc chloride solutions

2. Generally require special consideration or actual test under specific conditions, but usually satisfactory.

Bleach solutions
Bromine water
Chlorine water
Sodium hypochlorite solutions
Peroxide solutions
Ammonium bromide
Ammonium nitrate

3. Generally unsatisfactory

Nitric acid
Chromic acid
Pure bromine
Aqua Regia
Sodium chlorite in acid solutions

STABILITY IN STORAGE:

Unlike most resin cements which deteriorate rapidly in storage and can be purchased safely only in quantities immediately needed, Duracite has practically an indefinite shelf life. Thus, adequate stocks can be carried in your stock room, available for immediate use for repairs or new construction. No costly delays while orders clear. No wastage loss from unused material.

U. S. STONEWARE
AKRON, OHIO

LUNKENHEIMER

TOP PERFORMANCE

COMES FROM SUPERIOR "Know How"

THE RESULT OF LONG ACCUMULATED EXPERIENCE PLUS QUALITY STANDARDS RIGIDLY MAINTAINED

Fig. 2129

HE'S INTERESTED IN TEN THOUSANDTHS OF AN INCH

If parts do not measure up to the stringent requirement for accuracy they never enter a Lunkenheimer Valve.

Fig. 2125

A BIG "PLUS" IN MOLDING —skilled men and modern machinery. This craftsman cleans cores; removes all parting line edges, assuring smooth castings on inside.

For over three quarters of a century, Lunkenheimer has specialized in the manufacture of valves . . . the most efficient and dependable valves which scientific design, engineering knowledge, and fine mechanical skill can produce.

"Quality" is a living ideal at Lunkenheimer—guiding every operation from design to final assembly. Maintenance men well know that quality. Through long experience they've come to rely on Lunkenheimer Valves for the best in performance at lowest maintenance cost.

A Lunkenheimer Distributor is located near you. His complete facilities are at your service.

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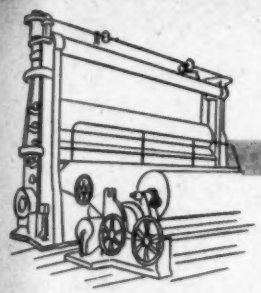
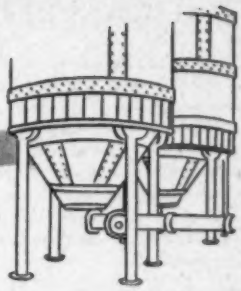
BRONZE, IRON, STEEL, AND CORROSION RESISTANT ALLOY VALVES—125 TO 2500 LB. S. P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS.

LUNKENHEIMER VALVES



Practical SHORTS



Readers are invited to submit short, practical articles for this department. The items should be original and should relate to ways and means of handling production and maintenance jobs. Where possible, articles should be illustrated. Rough sketches only are required. Payment will be made for acceptable items upon publication.

Honing Paper Cutting Knives

All new knives have a wire edge which must be honed off before the knife is bolted into the machine. Best results are obtained by using an oil stone.

Knives are placed on an inclined board with the edge of the knife projecting about ⅛" or ¼". Hone is held flat on bevel and used in a circular motion, without being lifted from the knife. All knives are honed immediately after they are removed from the grinder.

Most grinders use three stones which are graduated in texture. They first hone with

a medium India stone, then a fine India stone, and finally with an Arkansas oil stone.

Sometimes fringes of wire cling to the edge. They can be removed by rubbing a piece of hard wood lightly along the knife.

To remove a wire edge that appears along the flat of the knife, lay the hone on lightly with no pressure, absolutely flat, and draw from one end to the other. Never attempt to hone the flat side or the bevel when the knife is in the machine. A hollow grind should be honed with a slightly convex, very fine hone.

It is wise to paint the knife with machine oil after it has been honed to prevent rusting. The oil should be rubbed off before the knife is used.—"Paper Cutting," HENRY DISSTON & SONS, INC.

◆

How Tight Is Tight?

The "feel" of a properly tightened nut and bolt can be acquired by practice, wrenching up the nut until the bolt seems to be pushing the wrench back where it came from. As a check on the proper tightening, the bolt length can be measured with a micrometer before and after tightening. For each inch of bolt length, the ideal amount of stretch in a properly tightened bolt is .003 in. Actually, a stretch ranging .002-.004 in. is satisfactory. Practice, checked by measurement of stretch will develop the "feel" for tightness.—United States Army Ordnance Department, through *Fasteners*, Vol. 1, No. 3 (Published by American Institute of Bolt, Nut and Rivet Manufacturers).

◆

Keying Rotary Kiln Ring

In lining rotary kilns, the blocks in each ring are held securely in place by means of forms or packs, until the ring is keyed. Keys should never be cut to a size smaller than that at which the outer chord is about two-thirds that of an uncut block. It is better to cut each of two or three blocks a small amount than to use a key brick which is cut so small that its strength is impaired. Each ring in a rotary kiln lining must be keyed very tightly. If this is not done, the upper part of the ring will "droop" away excessively from the shell after the removal of the form.—*Modern Refractory Practice*, HARBISON-WALKER REFRACTORIES COMPANY.

◆

Dandy Roll Support

Figure 1 illustrates a wire that is not supported under the dandy roll. In this case the distance between suction boxes, A to B, is too great and as a result the wire sags below the line of the suction box covers. This is a primary cause of many wires cracking back of the seam. The cracking usually occurs from ⅛ to ½ in. back of the seam and this distance is determined by the angle of deflection and the speed of the wire.

FIGURE ONE

The recommended method for correcting this condition is the placing of a table roll on each side of the dandy roll as illustrated in Figure 2. The two rolls, C and D, are placed so that the line of contact with the wire is at the same level as the top of the suction box covers. In some cases, it is considered good practice to have the rolls .005 in. to .010 in. above this level. The distance between centers of the rolls should never be great enough to permit the wire to sag under the dandy. If the distance between A and B is not enough to accommodate two rolls, then one table roll at position C will be adequate. Conversely, if after the installation of rolls C and D there is still too much space between A and C, then an additional table roll E should be added as shown in Figure 3.

In some cases the distance from the last table roll to the first suction box, F to H in Figure 3, is too great. This will allow the wire to deflect and the results would be the same as have been outlined. A table roll, G, placed adjacent to the first box is recommended at this position for proper support of the wire as it approaches the suction box cover.

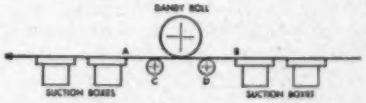


FIGURE TWO

If table rolls turn freely, and without slippage, they are a negligible factor in wire wear. The use of additional rolls for the proper support of fourdrinier wires should be considered when needed.

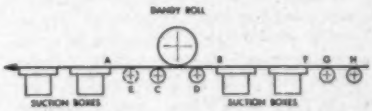


FIGURE THREE

It is desirable to bevel or round off the edges of suction box covers. This will permit water and stock to flow between the wire and covers for proper lubrication.—EASTWOOD-NEALLEY CORPORATION.

◆

General Motor Overhauling

Motors should generally be given an overhauling at intervals of five years or so, normally, or, if the service is more severe, more frequently. This practice is beneficial in avoiding breakdowns and in extending the useful life of the equipment. Where periodic overhauling is practiced, the following notes may be helpful.

Check the motor air gap, between stator and rotor, with feelers for uniformity. Too little clearance at the bottom may indicate worn bearings.

Take the motor apart and inspect it thoroughly. Measurement of the bearings and journals may disclose need for new bearing linings. Remove the waste from waste-packed bearings and rearrange or replace it, so that any glaze on the wool is removed from its point of contact with the shaft. Any gummy deposit on the wool should be replaced. All lubricant

should be cleaned out of the bearings and a fresh supply put in when the motor is reassembled.

The rotors should be cleaned with a solvent to remove any accumulated dirt, after which any rust should be removed with fine sandpaper (not emery paper). When clean and dry, the rotors should be coated with a good grade of clear varnish or lacquer to protect them from moisture. To prevent injury to the bearings, they should be completely protected with a clean rag when the motor is disassembled.

The rotors of wound-rotor motors should be given the same treatment as the stators. In addition, soldered joints and binding cords should be inspected and any weakness remedied.

Stator windings, of course, should be thoroughly cleaned and reconditioned if necessary. The stator bore should be cleaned of dirt with a solvent, and any rust should be removed with fine sandpaper (not emery paper). Care should be taken during this operation not to damage the top sticks or end turns of the stator winding. When the stator bore has dried, any remaining dirt in the bore should be wiped out with a cloth or brushed out with a soft brush. A hand bellows or dry compressed air at low pressure may also be used.—*O. F. Vea, Motor Division,* GENERAL ELECTRIC COMPANY.

◆

Emergency Measures in Case of a Chlorine Accident

Warning of the presence of chlorine is given immediately by its pungent odor and greenish-yellow color. The odor is so disagreeable even in minute quantities that all persons in the affected area will be aware of its presence. When chlorine is noticeable in the atmosphere, either by sight or by smell, the following precautions should be taken immediately:

(a) Avoid panic
(b) Refrain from coughing
(c) Keep mouth closed
(d) Avoid deep breathing
(e) Keep the head high (Chlorine seeks the lowest possible level)
(f) Withdraw from the affected area

First Aid Treatment

(a) Carry patient from gas area preferably to a room at about 70 Fahr. Supply blankets if necessary. Keep patient warm and quiet. Rest is essential.

(b) Place patient on back with head and back elevated.

(c) Call physician immediately.

(d) Strip off clothing splashed with liquid chlorine and chlorinated water, otherwise irritation and acid burns of the skin will result. Keep patient warm with blankets.

(e) Give carbon dioxide and oxygen mixture. Carbon dioxide content of mixture not to exceed 7%. This mixture, already prepared and sold with the necessary apparatus, can be administered intermittently for periods of two minutes over a period not to exceed 15 minutes.

(f) Milk may be given in *mild* cases as a relief from throat irritation.

(g) If breathing has apparently ceased, start immediately the artificial prone pressure method of resuscitation (Shafer). Do not exceed 18 movements per minute.

(h) Provide first aid as prescribed for emergencies by your company physician pending his arrival.—*Chlorine* (6th Edition), THE PENNSYLVANIA SALT MANUFACTURING COMPANY.

◆

Know Your Files and Get Ahead!

You wouldn't drive a spike with a tack-hammer, shave with a bowie-knife, or cut cloth with a sheep shears. It is equally important to select *the right file for the job* (plus a good handle of proper size). Deep-biting double-cut Flat or Hand Files for fast metal removal; single-cut Mill Files for smooth finishing and edged-tool sharpening—these are elementaries in the rule book.

As the job becomes more specific, selection of files becomes equally specific. For keyways, slots, and for narrow work and sharp angles, the mechanic who aims to get the most out of his files and filing skill selects Pillar, Square, Three Square or Warding Files; Knife Files for extra-narrow spaces. For the infinite angles, curves, holes and slots encountered in model making and die making, or for fine-instrument assembling and repairing, there is a multiplicity of shapes, sizes and cuts in small "precision" files commonly known as "Swiss Pattern."

Thus all files, in a measure of speaking, have a "special purpose" or reason for their existence in particular sizes, cuts, shapes or other characteristics. Under today's fast-moving industrial progress, production methods, machine-shop practices, and metal and alloy developments, there has been brought about a need for a distinct group of Special Purpose Files with which the modern mechanic will do well to become familiar.—NICHOLSON FILE COMPANY.

◆

How to Make Belts Endless on the Job

Whenever possible, leather belts should be made endless on the job. This avoids possibility of damage to the belt which frequently occurs when an endless belt that is a tight fit is forced over the pulleys. The proper procedure for making belts endless on the job is described and illustrated in the following outline.

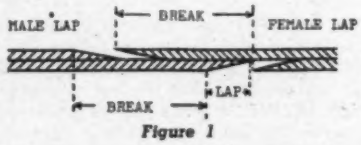


Figure 1

1. Shorten pulley centers to minimum

2. Never cut a new belt to length using the old belt for sample. Take steel tape measurement around pulleys, and never add to this measurement to make sure of having enough. Rather, reduce the length, the usual practice being about ⅛ inch per foot. For single-ply belts, add the length of the endless lap as shown in Table I.

TABLE I—Single Belt

Width of Belt	Lap Length (inches)
Up to 3½"	4
4" to 10"	5
Over 10"	6

For double-ply belts, increase the length by an amount equal to the sum of the lengths of the lap and the break (Figure 1) as shown in Table II. This is the length of leather to be cut from the roll for the belt. The ends of the belt should be cut square with its edge using either a knife or good belt cutter (Figure 2).

TABLE II—Double Belt

Width of Belt	Lap Length Per Ply (inches)	Break Length (inches)
Under 8"	4	8
8" to 12"	4	10
12" to 18"	4	16
18" and over	4	20

3. Prepare belt lap. *If single-ply belt:*

(a) Draw a line across the heels of the laps, the laps being so planned that they will point in the same direction as the other laps in the belt.

(b) Shave down belt ends tapering evenly from heels to tips (Figure 3).

(c) Remove high spots with belt scraper and finish to feather edge so that the completed lap will be same thickness as body of the belt (Figure 4).

(d) Roughen belt fibres with scratcher. (Card clothing approximately No. 26 or 28.) (Figure 5.)

(e) Brush off loose fibres.

If double-ply belt:

(f) Separate plies on female end of belt for a distance three inches longer than over-all lap length (Figure 6).

(g) Cut back the bottom ply an amount equal to the break. (For ease in splicing, the long leg of the female end should always be made on the top ply of the endless or field lap.)

(h) Shave female end as shown in sketch (Figure 7).

(i) Shave outer surface of male end so that it matches in length with female end (Figure 8).

(j) Continue preparation of lap as for single-ply belt (See Section 3-c, d, and e).

4. Place prepared belt around pulleys so as to run in the proper direction.

5. Mark belt, using square, at points immediately beyond where clamps will be applied, this mark to serve as a guide in keeping clamps at right angles to the belt edge, and as a check against any slippage of clamps.

6. Place belt clamps as far back as possible to allow ample take-up on rods (Figure 9).

7. Tighten rods making one turn at a time on each rod so that length on both edges of belt will be kept equal. Where possible, rock or turn pulleys to work out all belt slack.

8. Fasten working platform (Figure 10).

9. If belt is drawn up further than anticipated, cut back male end to make laps match.

10. Apply waterproof cement sizing coat (Figure 11).

11. Let dry 30 minutes or until clear. If the first sizing coat does not dry with a shine, a second coat should be applied and left to dry (Figure 11).

12. Apply the final or sticking coat of cement. Quickly place cemented ends together, matching carefully, and press between boards with C clamps. A few tacks hammered in splice will help to keep ends from shifting (Figure 12).

13. Let dry for half an hour or more before removing C clamps and boards.

14. After allowing splice to dry thoroughly, for at least five hours, remove belt clamps and rods, as well as any tacks that might have been used.—AMERICAN LEATHER BELTING ASSOCIATION.

◆

How to Shorten a Leather Belt

When a belt becomes loose, it will slip excessively, causing loss of power and undue wear on the belt. A loose belt should be shortened immediately, following the approved procedure outlined below:

1. Apply belt clamps at field splice and tighten rods to relieve tension on it. The belt is then ready to be opened (Figure 13).

2. Fasten working platform (Figure 14).

3. Insert a large screwdriver or lap opener one to two inches back of the points of lap and work toward feathered edge (Figure 15).

4. After completely opening field splice, pull up belt desired amount by tightening the rods evenly.

5. Scrape off all the old cement on the female end.

6. Shorten male end and prepare to fit (Figure 16).

7. Prepare lap and cement as directed in the previous item. (On double belts, make the new lap on the male end.)—AMERICAN LEATHER BELTING ASSOCIATION.

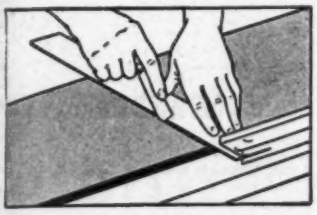
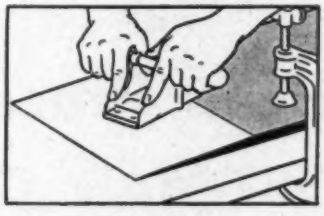


Figure 2



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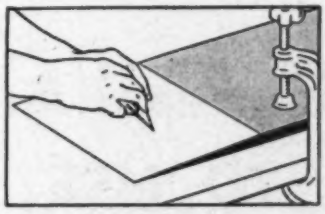

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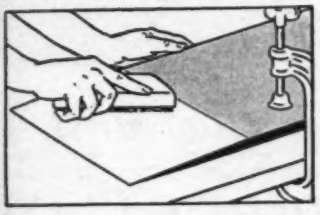
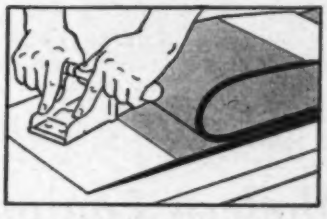


Figure 5

Figure 6



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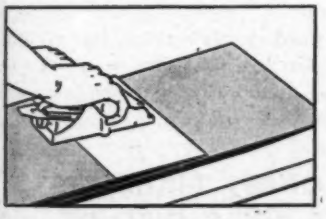

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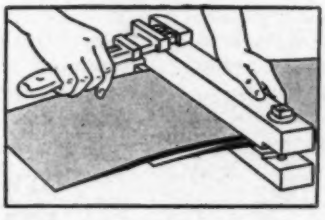

Figure 9

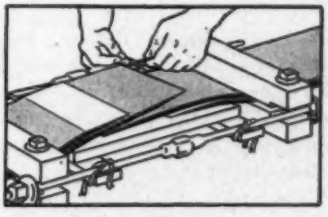

Figure 10

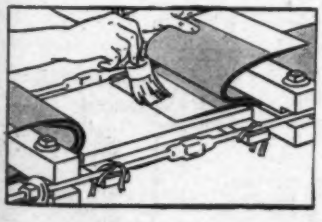

Figure 11

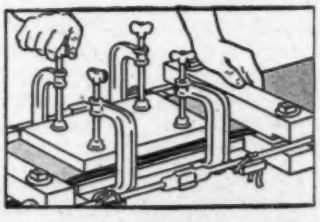

Figure 12

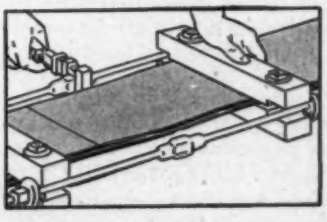

Figure 13

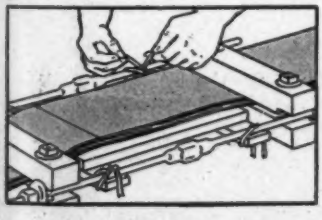

Figure 14

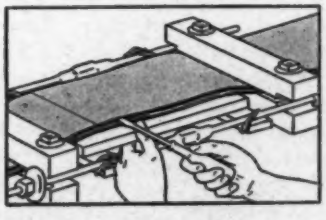

Figure 15

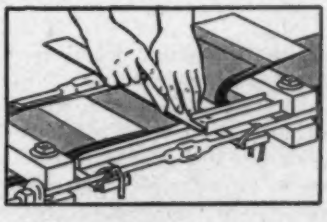

Figure 16

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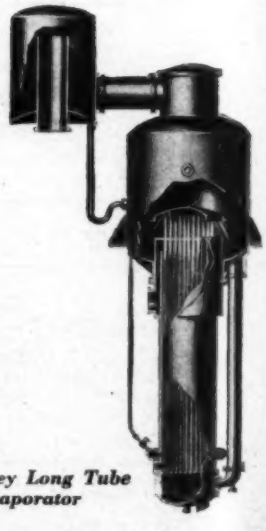

Right: A Conkey Long Tube Film Type Evaporator

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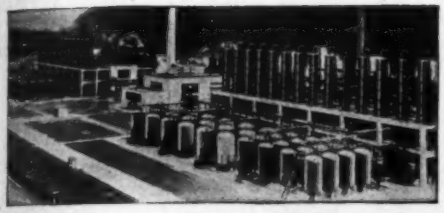

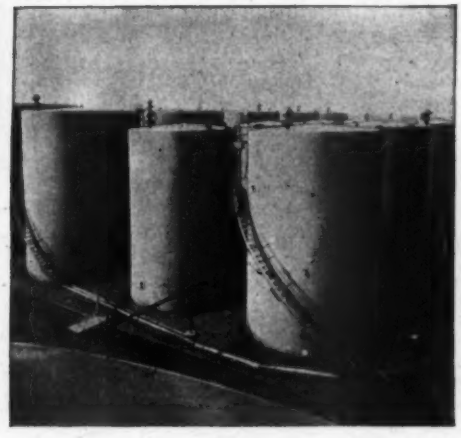

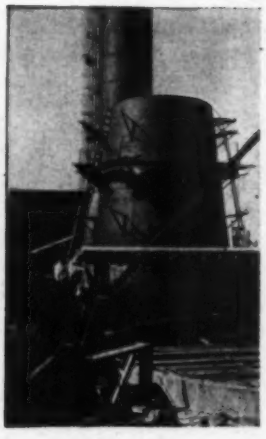

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Convention Papers . . . Abridged

This is the tenth installment of abridgments of papers presented at the annual meeting of the Technical Association of the Pulp and Paper Industry, held in New York City, February 14-17, 1944. Next month's issue will contain the final installment.

Postwar Planning of Paper Mill Steam Plants

E. F. BURNS, Chief Engineer, International Paper Co.

For the purpose of this paper: (1) The fuel situation, (2) revamping of present plants, and (3) new plants will be discussed.

A great deal has been heard recently regarding the post-war oil situation. Mr. Harold L. Ickes in an article "Oil from Coal—a 'Must' for America" (*Collier's Magazine*, December 4, 1943) which appeared in the December 4th issue of *Collier's* states that "our known oil reserves are equivalent to 12 or 13 years' consumption at the pre-war rate of 1½ billion barrels per year. But these reserves cannot continue to produce oil at that rate. The wells produce more slowly each year."

He further points out that "there is a growing conviction that the use of natural crude oil for the refining of heating oil is reprehensibly wasteful of a fluid too precious to burn just to keep us warm, when a less expensive and more abundant fuel is available."

It is pointed out in the article that some two years ago Congress appropriated $125,000 for investigation by the Bureau of Mines on the hydrogenation of coal, and that more recently the Department of the Interior is supporting legislation before Congress for $100,000,000 with which to build demonstration plants for producing on a small commercial scale gasoline and oil from coal and shale.

The *Toronto Financial Post* on February 5th of this year carried an article "Will Coal Power Our Cars" (*Toronto, Canada Financial Post*, February 5th, 1943) and suggests "with world consumption of oil practically doubled in the past decade and the possibility of an oil shortage facing the world not many years hence, Canada, which is producing only 17% of her own requirements, must be particularly concerned."

This article further points out that officials of the Dominion Bureau of Mines stress the importance of research and the establishment of a test plant to delve further into the synthetic fuel situation.

Stories reaching this country from Europe indicate that a large proportion of the high octane gas required by the German army and air force is being supplied through coal hydrogenation.

Someone is heard to ask why all this worry about oil shortage. There have been stories of oil shortage and depletion of crude reserves for at least 20 years and still oil is obtained. However, it is doubted if there are many who will place themselves on a limb to the extent of disagreeing with authorities of the United States Bureau of Mines and the Dominion Bureau of Mines.

Some oil geologists feel that the peak of oil development has been reached and that the reason to assume that the curve will continue on the downgrade is that territory in the United States which could be developed is diminishing.

It has been definitely learned from this war that gasoline and oil are primary items of national defense of the first order. Without proper motor fuels, planes, tanks, and to some degree, ships are useless.

Negotiations and studies are underway for the construction by the United States of oil pipe lines from the Near Eastern oil fields to the Mediterranean Sea. With oil reserves depleted in this country, Asiatic pipe lines will be of little value to us in time of a future war if either the source or the discharge point is controlled by an enemy. A situation will be faced similar to the rubber situation; the source eliminated, making necessary the production of a synthetic substitute.

With all of his discussion and study into the oil situation, it is very doubtful if after this war, the oil reserves will continue to be used promiscuously with no regard or thought of the future. The author is firmly convinced that a great deal more thought will be given in the future to the exploitation of this natural resource with probably some control and use restrictions, especially when a comparison is drawn between estimated coal and oil reserves. Solid fuel reserves are estimated in this country to amount to approximately 5,000 years' supply; oil from 12 to 13 years. Certainly the answer is obvious.

There are now in the process of construction and test, plants designed to burn mixtures of pulverized coal and oil. It is not known exactly at present how high a percentage of coal may be burned in this way. Some belief is entertained that it may run as high as 40%.

It appears that an installation of this kind is more in the nature of a stop-gap than a thoroughly practical solution of the fuel problem, especially in view of the oil situation.

Unless the fuels are blended by the shipper, the handling and storing of two fuels will be encountered instead of one; the installation of pulverizers and drying equipment for the coal, and heating and mixing equipment. Mixing the proportioning must be closely controlled; otherwise furnace and boiler operation will be seriously affected.

The present tight solid fuel situation is believed to be largely due to two factors. The first, of course, is the manpower situation at the mines.

The second factor is the loss of tonnage due to strikes and labor interruptions.

Today bituminous production is running approximately at the rate of 625 million tons annually and the estimated requirement for the year is about 620 million tons. This includes shipments to North Africa, Sicily, Sardainia, and Italy.

The present quality of coal is largely down. Analyses coming to attention show, in some cases, increases in ash content of 30 to 40% and more from the same operations. In other words, a 5% ash coal of 2 years ago may run 6.5 to 7% in ash today. This is due largely to the manpower situation and to the loss of control of quality output by the operators.

An easing of the coal situation during the war is not expected except in some degree through intelligent regulation. Strikes

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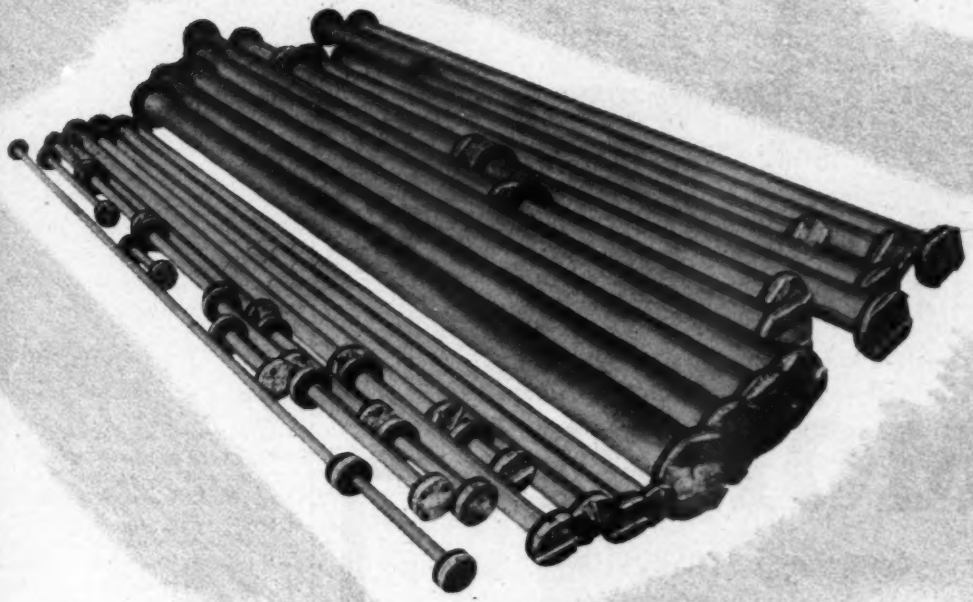

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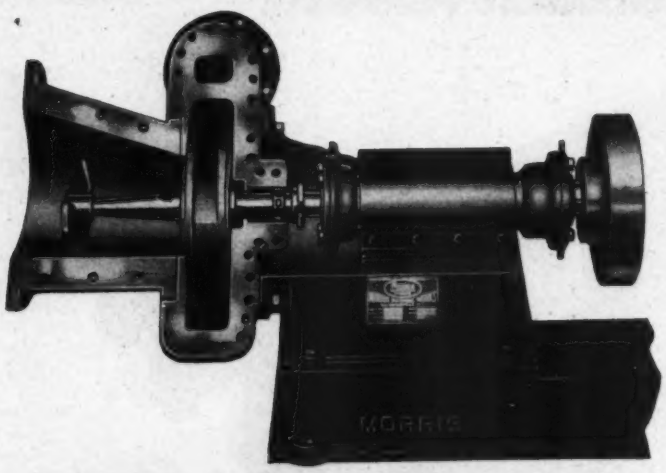

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and mine tie-ups cannot be continued, and at the same time sufficient coal to fill requirements be produced. Neither can high rates of industrial production be maintained if everything which comes out of the mines is considered coal because it is black.

If the analyses of the postwar oil situation given above is correct, then it follows that coal consumption after the war will not drop due to reconversion of coal burning plants to oil. On the other hand, a general tightening up of oil for industrial purposes and possible forced conversions from oil to coal in plants now using oil in the conversion of those plants from wartime to peacetime industries is to be expected.

It is quite conceivable that coal may become the source of many more synthetics including, of course, gasoline and oil.

It is intended to imply in the foregoing that a tremendous coal shortage is imminent in the postwar period. However, do not look for large surpluses in a buyers' market.

As to the price of coal in the postwar picture, prices will probably not drop materially. Mine wages will be maintained at levels higher than during the prewar period. Demand for coal will be up and, therefore, no material reduction in price.

With some 700 paper mills in the United States, not to mention numerous separately operated pulp mills, each faced with its own individual problems and conditions, it is, of course, impossible to standardize on any one revamping program. TAPPI Special Report No. 332 gives steam plant operating data from 126 paper mills, and seems to give a fairly representative cross section of paper mills in this country. A very few questionnaires were sent to Canada and perhaps one or two to Mexico.

It is interesting to note the wide variation in boiler plant operating efficiencies of the reporting mills. They range all the way from below 60% to 96%, the last, of course, being an electric steam generator located in Canada.

Forty-eight plants or 38% of the reporting mills reported combined boiler operating efficiencies of 81% and above, with an unweighted average of about 83%. If this were the general trend in paper mills, there would be very little to discuss. Seventy-eight of the mills, or 62%, however, operate their boiler plants at 80% and below. The unweighted average efficiency of the 78 plants is 72.7%.

The American Paper and Pulp Association has kindly furnished the following figures as a basis for estimating the amount of coal consumed by the paper industry in 1943.

The total paper produced in the United States during the year 1939 was, in round figures, 13,500,000 tons and in 1943 it reached slightly more than 17,000,000 tons.

The 1939 coal, oil, gas and coke consumption figures were also available which enabled the construction of coal equivalent for that year, amounting to 12,337,000 short tons consumed. This, prorated to 1943, gives an equivalent coal consumption of 15,530,000 short tons.

Now, if it is assumed that the steam plant survey is representative of the indus-

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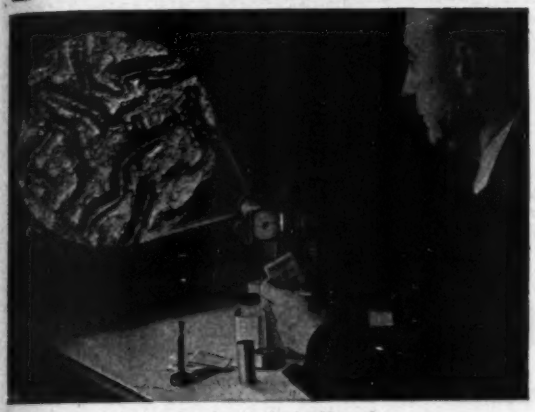

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try, then it follows that by increasing the operating efficiency of the plants in the lower bracket to the average in the upper bracket, an equivalent coal use of approximately 1,200,000 tons per year, based on 1943 equivalent consumption, will be saved.

This represents something like $7,000,000, in this one item alone, which is thrown away annually and after correcting for the amount of gas consumed, is equivalent to roughly 22,000 coal and tank cars uselessly hauled each year.

Assuming that the plant is being operated as efficiently as existing equipment will permit, and that the plant is still in the lower efficiency bracket, then attention must be turned toward the formulation of plans for revamping the plant during the postwar period.

Some plants, replying to the questionnaire, estimate plant efficiencies because they have no flow meters. Certainly a plant cannot operate efficiently except by the greatest stroke of good fortune if it does not know what it is doing. It may think that it is operating at 75% efficiency only to find by actual measurement that it is operating at 60%.

To those plants which are attempting to operate without metering equipment, the suggestion is made that meters be purchased and installed at the first opportunity.

Some of the boiler plants in the lower efficiency bracket are hand fired. Needless to say, a hand fired unit is an inefficient unit in today's measure of efficiency. It would seem, too, from descriptions given for some of the stoker fired plants that in a great many cases, the equipment is antiquated and should be replaced with modern and up-to-date firing equipment.

Undoubtedly a large number of plants have no soot blowing equipment. Certainly soot blowers should be investigated and installed.

The question of feedwater treatment control was not specifically checked in the questionnaire. However, it is safe to assume that a great many paper mill steam plants do not properly control feedwater treatment. An investigation of this subject may lead to very large dividends. A great deal has been published on this subject and it will not be discussed here except to point out that improper treatment of feedwater may lead to large heat losses caused by boiler scale and improperly controlled blowdowns, not to mention troubles from pitting, corrosion, carry-over, etc.

Thirty-six plants reported no combustion control and several other plants reported only semi-automatic control. Here again, investigations may point out that combustion control apparatus can be installed and paid for out of the savings made in one or two years.

Forty plants reported neither economizers nor air preheaters and a large number, no superheat. This subject can only be touched upon briefly here. It may be more economical in some cases to install economizers rather than preheaters. In other cases, the reverse may be true, all depending on the type of boiler and furnace equipment involved and space available. Certainly excessively high preheat temperatures are not advisable with most types of stoking equipment as too high preheat temperatures may greatly increase stoking and furnace maintenance. Therefore, this subject is one for study of the individual plant, both as to cost and final results desired.

The question of superheat, too, is one for study of the individual plant based on over-all economics. For instance, if paper machines are steam engine driven, high steam temperatures may definitely be detrimental. On the other hand, superheat may be of definite value if the steam is used to drive a steam turbo-generator.

In the above, only a few of the items which should be considered in the postwar revamping of existing power plants have been touched upon. It appears to be reasonable that now is the time to give consideration to the postwar installation of such equipment as the above, in order to place the mills in a better position to compete in the postwar market.

In what way will the fuel situation affect the postwar planning of new power plants?

1. The postwar boiler will undoubtedly be coal fired, either stoker or pulverized coal. In fact, one large manufacturer informed the author that few, if any, requests are being received for figures on plants for the firing of oil.

2. More attention will be given to the more efficient operation of recovery units and waste incinerators and in isolated cases, there may be some installations of electric steam generators.

3. The trend will be toward higher operating pressures in paper mill boiler plants. Plants designed for operation at 400 to 600 psi and higher will be more common, and higher final steam temperatures made possible by the installation of more superheaters. These installations, especially in

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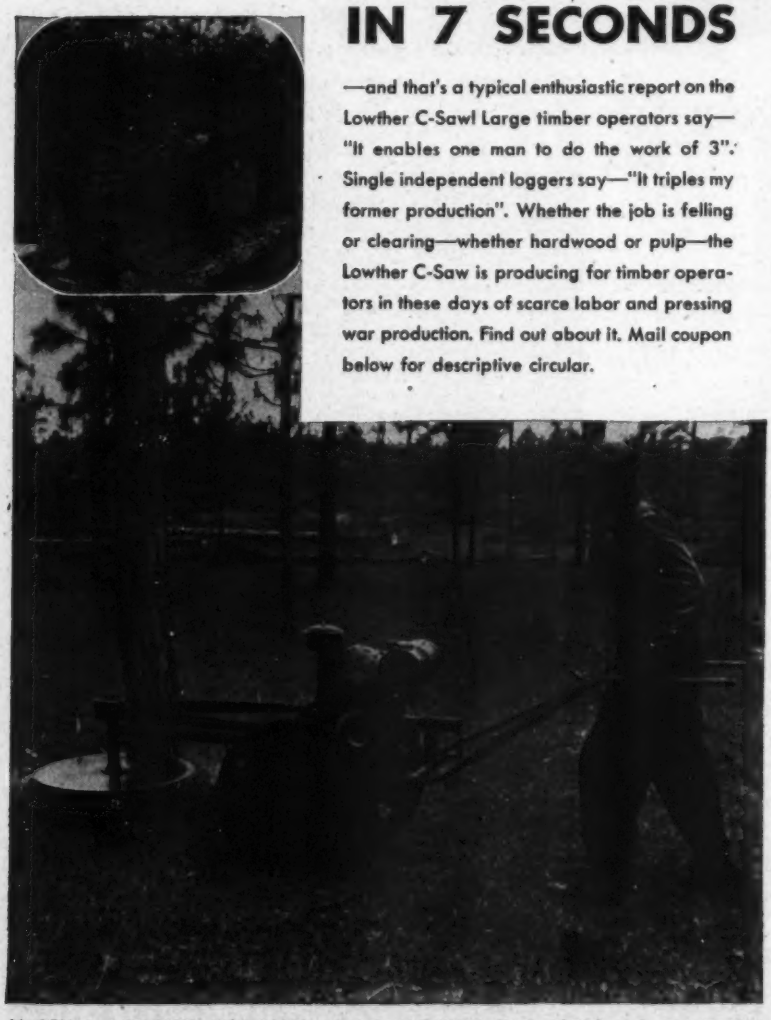

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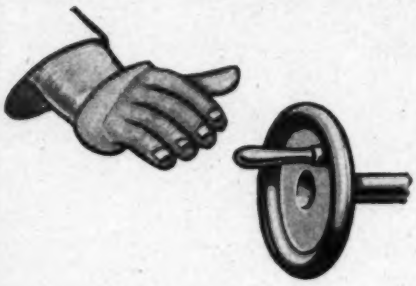

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5. Boilers will be equipped with suitable heat recovery equipment, either air heaters, economizers, or a combination of the two.

6. Unless definite steps are taken to increase mine control and quality, new plants will have to be designed to cope with higher ash, lower ash fusion, and lower B.t.u. coal. As a matter of fact, the high quality coals are rapidly being depleted, in some districts completely being worked out, leaving higher ash coals to be produced.

A few of the larger mines have installed cleaning plants to reduce the ash content of the coals produced, but it appears that the amount of cleaning plant coal which will be available in the near future will be a very small percentage of the total production.

7. Suitable combustion control and metering equipment should certainly be a part of every new plant.

8. More attention will be given to the economic use of steam, electricity, air, and water around the mill by the use of more efficient equipment throughout the mill as a fuel conservation measure.

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E. V. ULLMANN
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The duPont Solozone system of groundwood bleaching is no longer in the experimental stage, as a certain paper mill has produced a high class paper of 30% sulphite and 70% bleached groundwood for a long time, but in order to make the bleaching still more economical and efficient, future plants should install the most modern designs of pulp bleaching machinery and equipment.

The first question arising will be whether bleaching should be effected in batches or in a continuous operation. The writer definitely is in favor of the latter because a continuous operation offers many advantages as compared with batch bleaching. The design is simpler and takes much smaller space, mainly because in a continuous bleaching plant, towers can be utilized instead of chests, which will increase the building in height but reduce the ground area. The continuous system is also easier to supervise because the constant flow of pulp through the plant can be regulated in regard to chemical consumption, consistency, and time, and once started only small changes have to be made from time to time. This naturally means less manpower for as a rule a continuous bleaching system, even up to 250 tons a day or more, needs no more than two men for the supervision. The product from a continuous system will be more even than that from a discontinuous one because the delivered output is checked continuously and can be regulated as soon as a tendency to vary from the desired figures is discovered. Another advantage to which little consideration is given but which is of no small importance, is the lesser wear and tear as well as corrosion on machinery operating continuously than on machines operated at intervals; a fact well known to any mill operator. Also the great peaks in water and power consumption that are apt to occur in a discontinuously run plant, do not exist in a continuous system where consumption curves are running more evenly along the average line.

The special difficulties of treating groundwood pulp are well known; the coarse form of the fiber bundles in groundwood has characteristics differing from those of chemically treated wood pulp. In the latter every individual fiber has its surface subject to attack from chemicals in the liquid surrounding it, whereas the fiber bundles of groundwood pulp have some fibers completely covered by their neighbors, while others are cut open and subjected to attack both from inside and outside. The difficulties encountered because of the different dewatering of these fibers are also well known.

In other words, these difficulties must always be given consideration when studying the special requirements of the sodium peroxide bleaching method demands from the machines used in the system. These special requirements can be listed as follows:

(a) An even flow and an even consistency

(b) A rapid and thorough mixing of pulp and chemicals

(c) Ample storage time which also must be combined with a certain flexibility of volume

(d) Efficient agitation during the whole process

(e) Thorough mixing as rapidly as possible, of the pulp and reducing agent.

(f) The transportation between each stage should be as rapid as possible, reliable, and uninterrupted

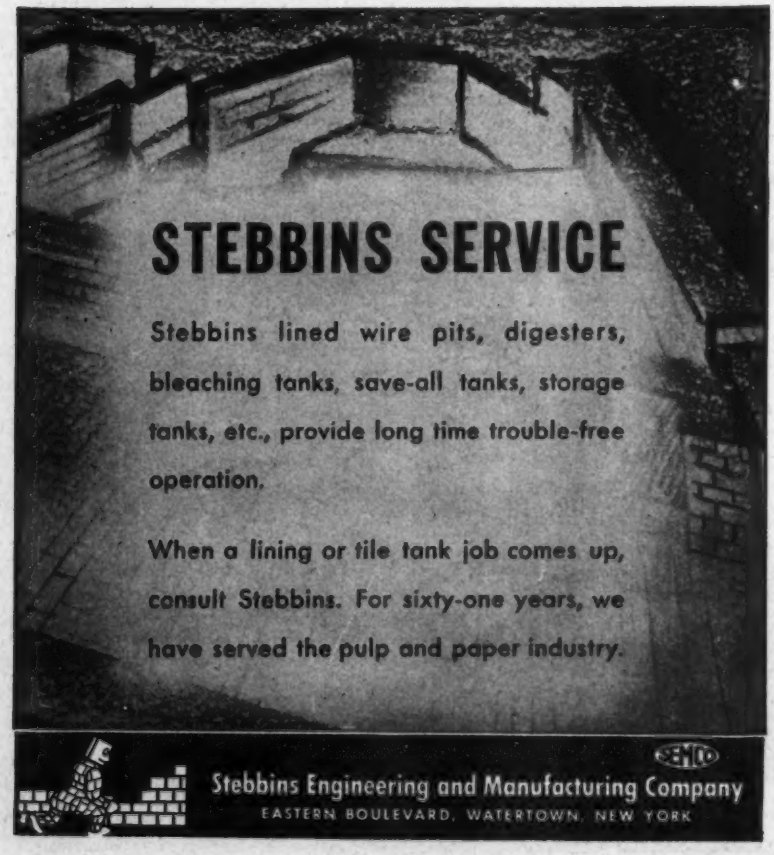
(g) The material used in the machinery and equipment should resist corrosion and temperature variations

(h) Last, but not least, the machinery must be absolutely reliable with no possibility of failure

An even flow can only be obtained by installing a regulator in front of the first stage of the bleaching.

The mixing of pulp and chemicals was previously made in a rather primitive way, i.e., by using a rotating agitator in a circular chest where the chemicals were added through a pipe directly into the batch. A more modern arrangement is where the pulp is continuously passed through a chute by means of a conveying screw, and the chemicals are added either in front of the screw, in the end of it, or both.

The modern method is to use a circulating pump. Because of the small surface coming in contact with the pulp, the im-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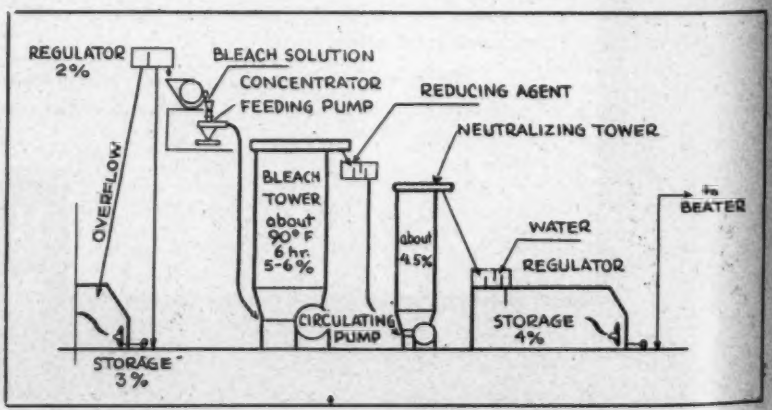
When treating pulp continuously, a tower is the natural shape to choose. The pulp enters the tower in the bottom, passing through it, partly because of the higher head on the suction side, and partly by means of the circulation pump placed in the bottom. The pulp is given a rotating movement in the bottom of these towers and as new pulp is steadily entering the suction side of the pump, the stock is slowly moving upwards in a spiral, overflowing on the top of the tower. The pumps are usually designed so that several times the amount of pulp added is kept in circulation by the pump, which insures a complete mixing of the entering pulp, and that already in the tower. The chemicals should most preferably be added directly into the bottom of the tower, simultaneously with the pulp, so that the mixing takes place immediately and just before stock enters the suction of the circulating pump. Strong agitation and mixing takes place in the pump.

Towers have been built with a volume up to 10,000 cubic feet which can give a treatment time in the towers of up to 3 or 4 hours. The time it takes for the pulp to pass through a tower naturally depends upon the density, and within certain limits the time can be changed by choosing different consistencies of the pulp. Thus a pulp of 2% consistency will pass through the tower in about half the time of that spent by a pulp of 4% consistency. Often, however, even a longer time is desired, and it may not be advantageous to change the consistency once chosen. In such cases, two or more towers are placed in series.

Underneath the overflow of each tower is arranged a special feeding pump which presses the stock into the bottom of the following tower. Any amount of towers can be arranged in that way, so that the time can be chosen freely. The maximum density in towers like these would practically be limited to about 7%.

The agitation should mainly take place in the beginning of the process, where it is most necessary in order to mix the pulp and chemicals thoroughly. It is obvious that the pulp is agitated violently while passing through the pump, and certain turbulence will continue within the dilution for some time after it leaves the impeller blades. At the same time, the whole stock is started in a circular movement, and because it is pressed upwards by the incoming pulp, the movement will be that of a spiral. Investigations that have been made reveal that this spiral movement takes place up to a height about two-thirds that of the tower. In order to get an even flow out of the tower over the top, a combined scraper and spray pipe is sometimes installed. The scraper serves to keep the stock revolving and should turn in the same direction as the spiral in the bottom. The spray pipe is necessary if the high

Figure 4 (below)



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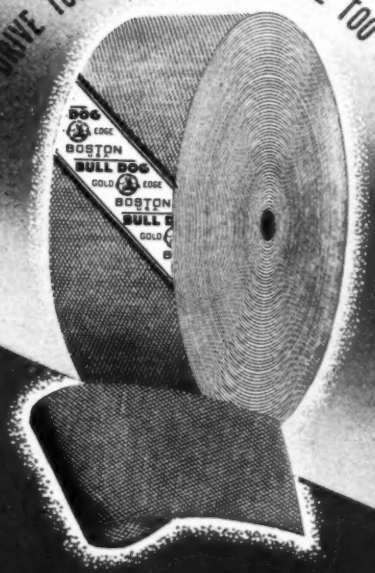

BOSTON WOVEN HOSE & RUBBER COMPANY

WORKS: CAMBRIDGE, MASS., U.S.A. P.O. BOX 1071, BOSTON 3, MASS., U.S.A.

consistency stock is to be transported by means of an ordinary centrifugal pump which normally doesn't work well with stock above 4 to 5%.

One of the most important machines in a modern bleaching plant is the transport pump. Here is a machine through which ordinarily the whole production has to pass uninterruptedly as far as possible, and it is of great importance that the pump be sturdy and reliable. Also, the power consumption must be as low as possible. A modern pump should be easily inspected, and equipped with ball bearings.

A new and modern transport pump is the so-called "built-in type." This pump has no suction pipe at all, the suction part of the impeller runs directly into the wall of the chest. The inner part of the housing is cast into the concrete, whereas the outer part with the impeller and shaft can easily be taken off from outside. A gate valve should be installed in front of the suction to enable removal of the pump without having to drain the chest or the tower.

Sometimes the pump is installed horizontally, i.e., underneath the overflow of a tower. It goes without saying that all possibilities of clogging in this way are eliminated, which is very important, particularly when groundwood pulp is concerned.

Usually all pumps, both circulating and transport pumps should be equipped with V-belt drive in order to enable small changes of the rpm of the pump if desired, i.e., when consistency is changed. Also, this drive offers a very flexible transmission between motor and pump.

It is usually desirable to use a material that will resist not only chemical attacks but also temperature variations. The peroxide bleaching method usually is not operated at temperatures above 120 Fahr., and thus a good quality rubber lining is satisfactory, which will stand any temperature below 150 Fahr. Above this the rubber becomes soft and is easily damaged by foreign objects that should happen to enter the system, such as small pieces of wood, tile, etc. To be on the safe side, of course, stainless steel is the best material.

The towers and tanks should always be tile lined. In the author's opinion, it is bad economy to try to save a few hundred dollars on this item. When properly tile lined, a tank will stand up clean and white for years, possibilities of sediments and clogging are decreased considerably, and the friction along the walls which always means waste of power is decreased to a minimum.

In case a discontinuous operation is necessary, for any reason, the usual way is to make each individual bleach in a batch-bleacher. The limit of consistency in a batch-bleacher is usually 6 to 8% and for reasons as mentioned before, a circulating pump is much to be preferred to a revolving agitator; smaller surface, less power consumption, easy accessibility and exchangeability, and a perfect circulation without any risk of clogging or sedimentation. The speed of the pulp circulating through such a bleacher should be about 6 to 12 feet per minute, and tile-lined walls will secure practically the same speed all over the chest.

It is sometimes desired to dewater or concentrate the pulp between two stages, at the same time doing a certain washing of the fibers. The oldest form for washing was rifflers, water extractors, or similar designs, and comparatively simple, but today's high qualities demand a much better washing and suction filters have been used in most modern bleaching plants for this purpose. A new filter made on this continent is the so-called "pressure filter." This filter works without any suction leg, and the basic principle is that impurities are more easily removed from the stock by crushing or pressing the water out of the pulp, than by sucking it.

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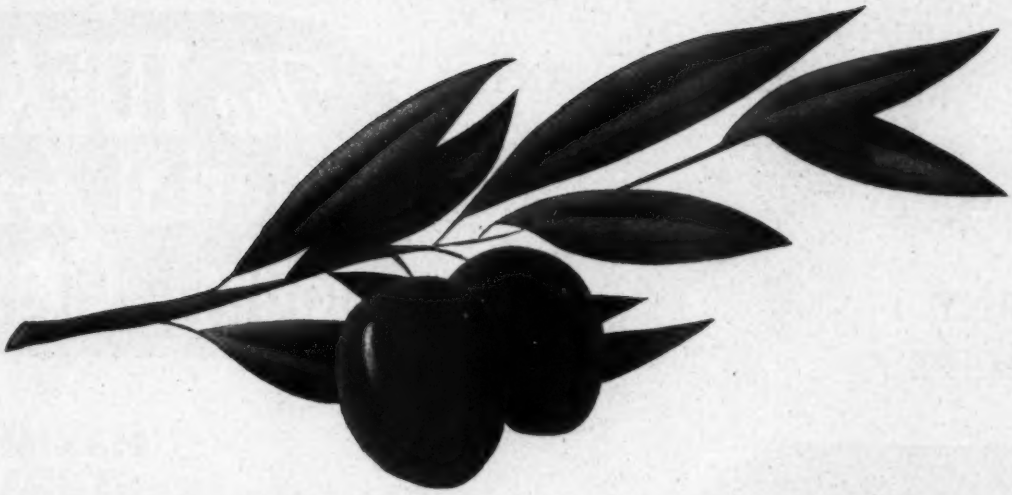


How a MACHINE and TWO OLIVES replaced FOUR MEN and THREE OLIVES

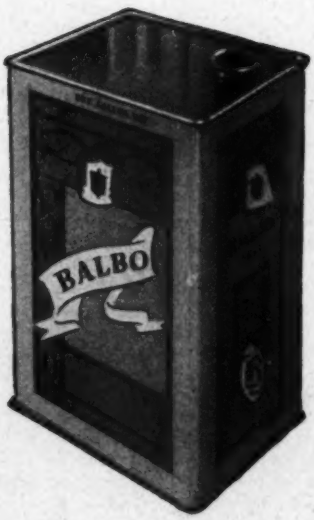
Making two olives do the work of three—or rather, making two parts of olive oil replace three—is of major importance in these times, **or any times.** And a machine that does the work of four men **and turns out five times more production** is something every business needs.

That's what the Balbo Oil Company, a leading producer of blended salad oils, accomplished with Bowser Liquid Control. Primary object was production—the Bowser way was five times faster than the old way. But Balbo also found that, with the homogenizing action of a Bowser Proportioner, 20% of olive oil gave an even better taste than 30% had previously—and **taste** is the reason for using olive oil.

But that's not all. Bowser Meters measure all incoming oil, and invoices are based accordingly . . . savings up to $24 per carload, in comparison with the former "railroad weight" basis, paid for the meters within a few weeks. Then—a Bowser Self-Cleaning Filter on the intake lines assures clear, bright oils for blending and all finished products go through other Bowser Meters en route to the packaging department—again saving time, labor, money . . . and doing a better job.

In the paper industry, too, Bowser Liquid Control—lubrication systems, force-feed lubricators, oil filters for steam engines, flow indicating devices, etc.—is doing a better job.

Bowser Lubrication Systems are used by virtually all pulp and paper mills in the United States and Canada, as well as many in Europe, for lubricating dryers, calender stacks, Jordans, hydrafiners and turbines. Bowser installations are engineered to become literally integral elements of the mills they serve. BOWSER, INC., Dept. 16-A, Fort Wayne 2, Indiana.



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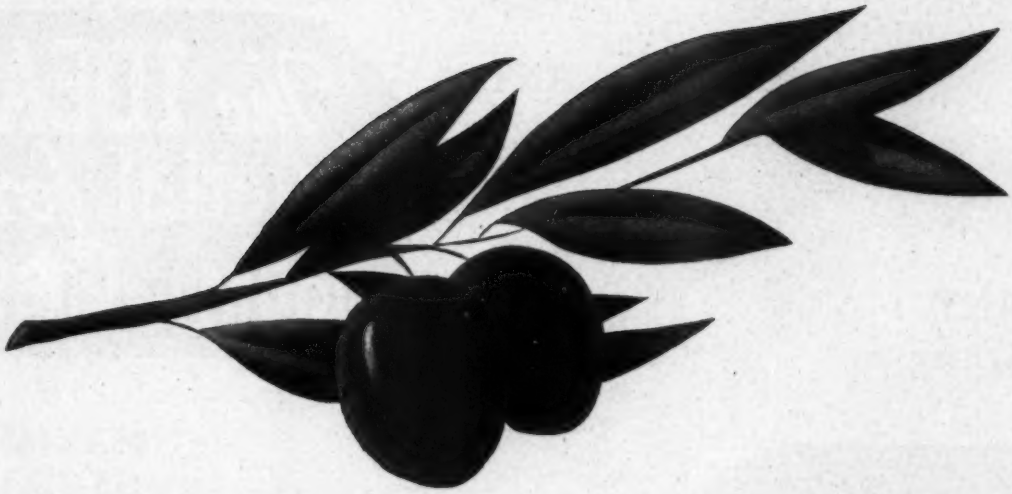

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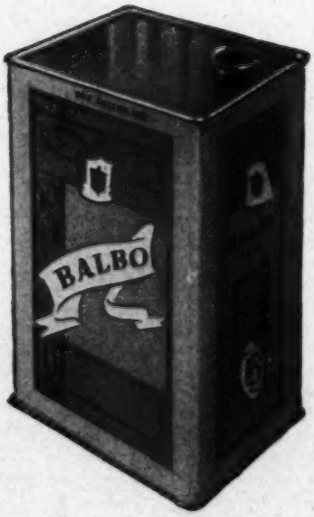

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A diagram of a proposed arrangement for a bleaching plant utilizing the sodium peroxide system, is shown in Figure 4. The regulator in front of the bleaching tower keeps the head and the consistency constant, and the following towers should be designed in number and volume so as to give the desired time for the actual bleaching. The storage chest after the towers is not absolutely required, but will serve as a buffer between the bleaching and the neutralizing. The neutralizing takes place in the last tower, at about 3 to 3.5% consistency, and to have chest volume, the pulp is concentrated to 4.5% on a filter before it is dropped into the storage chest. The filter simultaneously acts as a washing machine to remove all impurities from the pulp.

The space required for a bleaching plant where four bleaching towers are placed in a square and the neutralization tower in front of the storage chest is very small, 70 by 70 feet and 50 feet high, and for small capacities and limited space, the building can easily be decreased even more.

Low-Pressure Laminating

J. D. NELSON, Plastics Dept. General Electric Company

The first low-pressure laminated objects, and still by far the largest volume, were those requiring very little structurally, outside of stiffness and moisture resistance. Disregarding sheet stock, applications which naturally suggest a low-pressure technique are those which are not easily laminated by the conventional high-pressure methods, but still require to a large degree the toughness obtained from the continuity of fiber found in laminated products. Usually of irregular contour, such aircraft parts as fairings, fillets, housings, cowlings, ducts, and the like are excellent examples of objects which would be extremely difficult if not impossible to laminate at high pressure; yet because the loads they are required to carry are not particularly severe, their production by low pressure is entirely feasible. Recently, Fiberglas and high-strength paper laminates have extended the applications to include semistructural and structural items.

A clear picture of the differences between high- and low-pressure laminating is essential for an understanding of the potentialities of the latter. While high-pressure laminating of sheets, rods, tubes, and molded laminated articles usually involves the pressing of impregnated and dried sheet stock material at pressures ranging from 1000 to 2000 psi, the low-pressure range is less than 300 psi, the bulk of it actually being done below 100 psi. A further important differentiation is in the type of pressure itself. Unidirectional or platen pressure is employed in high-pressure techniques. In the majority of low-pressure processes, on the other hand, omnidirectional or hydraulic pressure is utilized. Curing temperatures in high-pressure laminating run from 150 to 165 C. for phenolics to 130 to 150 C. for ureas. The corresponding temperatures in low-pressure laminating may be the same, but sometimes are lower. This is especially desirable where a rubber diaphragm or bag is used repeatedly as the hydraulic membrane.

The fabric or paper base stocks for high pressure work has been dried to a relatively low volatile content, the high pressure being required for compression and bonding of the individual laminates. Since the low-pressure sheet stock is bonded at lower pressures and in addition must be formed to shape both before and during the laminating operation, much higher volatiles are in order.

The correct combination of resin and filler depends largely on the individual part and choice of low-pressure operation. In a majority of cases, the stock should be flexible, since it probably will be formed over complex curvatures. A loosely woven cloth naturally suggests itself as a suitable filler material. However, too loose a weave will considerably lower the strength values and materially affect the bond. Paper base materials bond much better at low pressure than cloth base laminates, but of course their formability is inferior. For secondary parts, where assembly times and not strengths are of prime importance, the use of creped paper has been put to good advantage. For parts requiring the highest tensile and flexural strengths, paper base laminates, particularly the high strength Mitscherlich sulphites, are being efficiently used through the medium of proper tem-

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General Electric Company

The first low-pressure laminated objects, and still by far the largest volume, were those requiring very little structurally, outside of stiffness and moisture resistance. Disregarding sheet stock, applications which naturally suggest a low-pressure technique are those which are not easily laminated by the conventional high-pressure methods, but still require to a large degree the toughness obtained from the continuity of fiber found in laminated products. Usually of irregular contour, such aircraft parts as fairings, fillets, housings, cowlings, ducts, and the like are excellent examples of objects which would be extremely difficult if not impossible to laminate at high pressure; yet because the loads they are required to carry are not particularly severe, their production by low pressure is entirely feasible. Recently, Fiberglas and high-strength paper laminates have extended the applications to include semistructural and structural items.

A clear picture of the differences between high- and low-pressure laminating is essential for an understanding of the potentialities of the latter. While high-pressure laminating of sheets, rods, tubes, and molded laminated articles usually involves the pressing of impregnated and dried sheet stock material at pressures ranging from 1000 to 2000 psi, the low-pressure range is less than 300 psi, the bulk of it actually being done below 100 psi. A further important differentiation is in the type of pressure itself. Unidirectional or platen pressure is employed in high-pressure techniques. In the majority of low-pressure processes, on the other hand, omnidirectional or hydraulic pressure is utilized. Curing temperatures in high-pressure laminating run from 150 to 165 C. for phenolics to 130 to 150 C. for ureas. The corresponding temperatures in low-pressure laminating may be the same, but sometimes are lower. This is especially desirable where a rubber diaphragm or bag is used repeatedly as the hydraulic membrane.

The fabric or paper base stocks for high pressure work has been dried to a relatively low volatile content, the high pressure being required for compression and bonding of the individual laminates. Since the low-pressure sheet stock is bonded at lower pressures and in addition must be formed to shape both before and during the laminating operation, much higher volatiles are in order.

The correct combination of resin and filler depends largely on the individual part and choice of low-pressure operation. In a majority of cases, the stock should be flexible, since it probably will be formed over complex curvatures. A loosely woven cloth naturally suggests itself as a suitable filler material. However, too loose a weave will considerably lower the strength values and materially affect the bond. Paper base materials bond much better at low pressure than cloth base laminates, but of course their formability is inferior. For secondary parts, where assembly times and not strengths are of prime importance, the use of creped paper has been put to good advantage. For parts requiring the highest tensile and flexural strengths, paper base laminates, particularly the high strength Mitscherlich sulphites, are being efficiently used through the medium of proper tem-

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plates prepared in advance. Such paper base laminates are far superior to cloth base mechanically and are approaching the latter in toughness.

The determination of the most advantageous resin content for each application will largely depend on the end use of the product itself. Since at best, the bonding at low pressures is only fair, enough resin must be present to make this the best possible. While moisture absorptions at low pressures are apt to be high, higher resin contents and more uniform impregnations will both help this property. However, too much resin will embrittle the part and destroy the toughness which most of these applications are called upon to exhibit. Cloth base laminates usually require more resin than paper base laminates for comparable end use.

After selection of suitable filler and optimum resin content, the correct treated condition for the laminated sheet stocks must be decided upon. The material should be wet enough to allow the natural formability of the sheet stock to take place and yet not too wet to be made under treating machine conditions. In addition, a very wet material has a poorer cure, excessive squeeze-out of resin, and resultant poorer bonding than a more correctly treated material. Too dry a material, on the other hand, will make bonding very difficult, in addition to impairing the filler formability mentioned previously. Paper base stocks, in general, are able to tolerate lower volatile and greater variation in volatile than corresponding cloth base stocks.

There is as yet no really standard equipment for low-pressure work. Each job requires individual considerations. The number of parts to be made, likelihood of part redesign, availability of equipment and facilities, and above all, the time factor, are some of the many problems which must be faced before a part can even be considered.

Most of the low-pressure methods of today may be classified into two types: those in which conventional molds and pressing equipment are used but of course, at much reduced pressures, and those in which one-half of the mold is rigid and the other half consists of a flexible membrane or sheet by means of which hydraulic pressure or its equivalent, is transmitted to the article being laminated.

The use of low pressures, especially in paper base sheet stock, has allowed considerable equipment, which otherwise could not have been used, to successfully produce low-pressure materials. In addition, the size of the sheets have been materially increased through the reduction in required pressure. By utilizing such mold materials as Kirksite, cast bronze, cast iron, and certain low melting alloys, mechanically adequate, low cost, and easily constructed molds have been made which could be used in conventional hydraulic presses at reduced pressures. The ability to be remelted and recast into new molds is another advantage of many of these materials.

When the hydraulic membrane or rubber bag process is used, the rigid half of the mold, whether male or female, may be constructed of the above mentioned cast materials, sheet metal, or such low cost and readily available materials as wood, concrete, plaster of Paris, papier-maché, and combinations of these. The hydraulic membrane or bag — usually rubber or rubberized fabric — is placed between the built up laminae and hydraulic medium to insure even application of pressure and suitable finish. The hydraulic pressure medium used may be steam, water, oil, air, etc., while the heat for laminating may come from either side of the molding surface, from the hydraulic medium or from a separate source. For large production quantities, autoclaves or pressure cookers are finding wide usage. For moderate production, inexpensive individual setups are frequently most economical. The common hat press is particularly adaptable for many low-pressure objects. A series of simple cast molds may be used interchangeably with the expanding rubber bag, the only serious limitation being that of size. Another common arrangement is the combination of a female mold in a conventional hydraulic press with a rubber male member.

Probably the widest used mold material at the present time is sheet metal. These molds are easy to make (they may even be the original parts themselves), are lightweight, impart good finishes, allow excellent heat conductivity and when used with the hydraulic pressure being exerted on both sides, are more than adequate mechanically. They are particularly useful where a large autoclave may be more efficiently filled and several objects produced in one curing cycle.

Wood makes an excellent, lightweight material for mold construction, but its service life is naturally limited and heat conductivity only fair. Improved construction is made possible by laminating plies of wood, treating the surfaces with hardening agents such as thermosetting resins, or lining the molds with cement or metal facings.

Concrete and plaster of Paris are both materials which are easily cast to shape, in addition to being capable of imparting a polished surface to the laminated article. Heating coils may be cast in the mold themselves or the mold thickness may be made as thin as possible to allow the quickest transfer of heat when placed in a curing ambient. Here too, however, relatively low serviceability is an important factor to be considered.

Papier-maché molds are finding limited use where the laminated parts require little or no pressure. Wood pulp and a water soluble binder are intimately mixed before forming to shape and drying. After the laminating cycle, the mold is destroyed by dissolving out the binder and removing the pulp. Although it can be used only once, the low cost and ease of construction make papier-maché attractive in many instances.

As one would naturally expect, lower laminating pressures mean less compression, poorer bonding, and lower gravities. In the case of paper base laminates, however, the bonding is but slightly inferior. As a direct result of these properties, the moisture absorption of those parts which are not specially treated to resist moisture is higher. On the other hand, lower pressures in combination with lower curing temperatures

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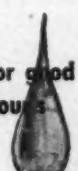

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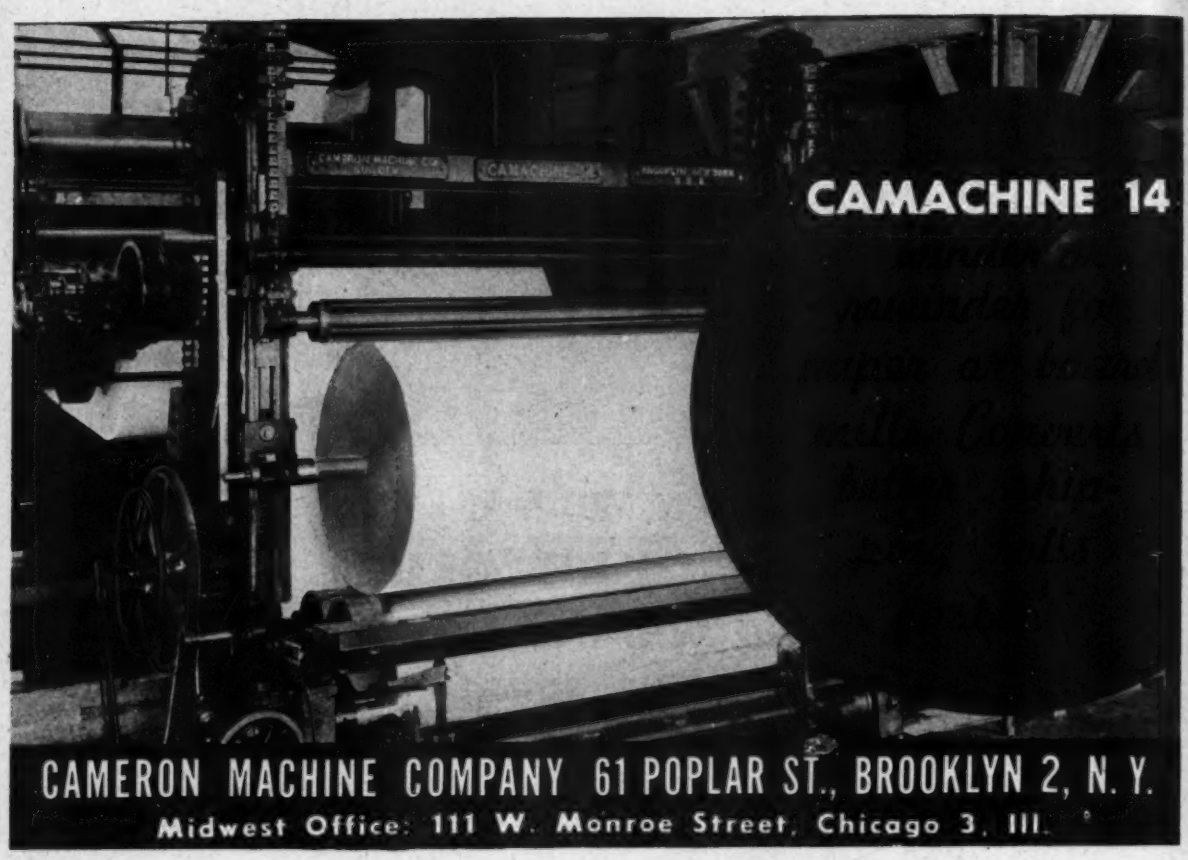

mean less distortion or rupturing of the laminate fibers, hence a more efficient utilization of the fibers themselves.

As far as actual strength values themselves go, that is tensile, flexural, compressive, and modulus of elasticity, the low-pressure laminates of a typical cotton cloth, laminated with phenolic resin at 65 psi pressure, exhibit generally slightly lower values than those of a comparable grade "C" high-pressure laminate, although the differences are minute compared to difference in pressure. Paper base stocks laminated with the same resin at 65 psi all show considerable strength advantages over both the high and low-pressure cloth laminates and are at least on a par with grade "X" high-pressure paper laminates. Among the paper base laminates themselves, ordinary saturating kraft gave the lowest values, certain rag papers were considerably stronger, and the Mitscherlich sulphite types were outstanding. In tension, the paper base stocks averaged 13,000 to 27,000 psi as against 8 to 10,000 psi for cloth base. In flexure, the values for paper were 25,000 to 30,000 psi as compared to 18,000 to 20,000 psi for cloth base. Compressive strengths for both cloth and paper stocks ran 40,000 to 45,000 psi, while modulus of elasticity of the paper stocks were higher, 800,000 to 2,000,000 psi as against 500,000 to 800,000 psi. Paper base stocks were slightly higher in gravity but lower in moisture absorption. In passing, it might be mentioned that low-pressure laminated glass cloth and glass cotton combinations give really superior strengths, but general utility is limited because of high gravity and relative unavailability.

In tensile, the strengths increase gradually up to about 300 psi pressure and then tend to level off or drop slightly. The phenolic resin gives superior strengths to the urea type. In flexure, there is a sharp initial increase in strength up to 100 psi pressure and then a leveling off or more gradual increase up to about 700 psi. It is revealing to note that about 2/3 of the potential flexural strength of the phenolic is realized at 100 psi while only 1/4 to 1/3 is realized with the urea. In compression, the strengths of both resin type laminates are comparable with the greatest increase occurring up to the 100 psi level. The corresponding moisture absorption values over the same pressure range indicate a sharp decrease in absorption up to 100 psi pressure and then a leveling off.

Actually a rough increase in strength of 25 to 30 per cent may be only a slight additional advantage resulting at higher pressures. Thus, at the present limits, the effective utilization of potential strength is quite high for the phenolic resin types. In flat sheet stock material using high strength paper and in certain other low-pressure molding operations, the pressure range of around 300 psi is already practical and giving excellent results.

Generally speaking, therefore, low-pressure laminating produces a type of product which compares favorably in most respects with high-pressure laminating. It is an obvious outlet for intricately shaped parts where weight savings and high strengths are essential. With the advent of flat sheet stock produced from high strength paper, table tops, radio panels, switchboard panels, instrument panels, and other applications which formerly were limited in use because of their inferior strength-weight ratios are now being successfully fabricated. Low-pressure laminating is solving many a problem now because of necessity, but it certainly possesses enough desirable characteristics to insure its rightful place in laminating for some time to come.

It is equally obvious that the role that paper base laminates are playing and will continue to play in low-pressure operations is large indeed. Possessing inherently good mechanical properties, coupled with the rapid strides being made in improving these properties, paper as low-pressure material has the following additional advantages:

1. Partial elimination of variations in laminating stocks
2. High yield of basic raw materials
3. Excellent bonding strength, even at very low pressures
4. High relative availability in normal times
5. Ability to impart very low moisture absorption to finished laminates
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7. Reduced cost

Some other miscellaneous applications of paper in low-pressure operations which come to mind are its use as a stiffening skin in high-strength-low density sandwich material and general utility in tube applications.

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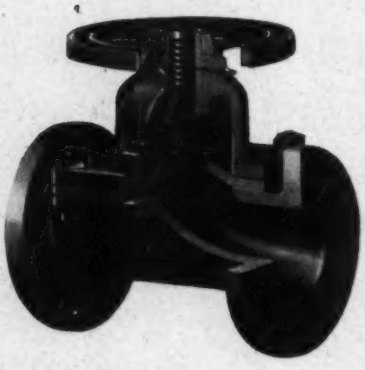

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Patents in the Postwar World

CHARLES W. RIVISE, Patent Attorney
Caesar & Rivise

Within recent years, the patent system has been subjected to attacks from many quarters and there has been considerable agitation for radical reforms.

It is not strange, therefore, that the general public is badly confused on the subject of patents, and that many people are inclined to the view that the patent system is in grave danger of being abolished or radically changed.

At one time the author was one of those who feared that the patent system was in grave danger of being radically changed. The recent warnings of impending changes have, however, caused no particular alarm. A reappraisal of the situation and of the many factors involved has caused him to take a calmer view of the matter, and it is now his opinion that there is no imminent danger that the patent system will be radically changed. It is yet too early to relax vigilance, in fact vigilance should never be relaxed, but all the indications are that the patent system will survive this global war with relatively minor changes.

Proposals for radical changes in the patent laws such as compulsory licensing, and the removal of the safeguard of secrecy as to pending applications are much older than the present administration. The Justice Department started on its crusade against the abuse and illegal use of patents prior to the election of President Roosevelt and long before Thurman Arnold became Assistant Attorney-General. The Supreme Court started on its present trend of invalidating patents and restricting the rights of patentees ten years before there was a single Roosevelt appointee on the bench. Several of the recent adverse decisions were, in fact, written by the more conservative judges. Chief Justice Stone wrote the majority opinion invalidating one of the Marconi wireless patents, and two of the so-called New Deal judges vigorously dissented.

It is true, of course, that a great deal of the present antagonism against patents is due to sincere but nevertheless misguided reformers, who blamed the system for certain abuses and illegal practices on the part of a small minority of patent owners. Part of the blame for the adverse criticism of patents must be placed on those patent owners who have endeavored to use their patents as a shield to hide flagrant violations of the antitrust laws, thereby discrediting the patent system and furnishing the excuse or justification as well as the occasion for many of the attacks.

A fact, which seems not to be generally known, is that many of the attacks on the patent system have come directly or indirectly from short-sighted industrialists, who

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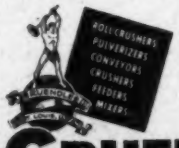

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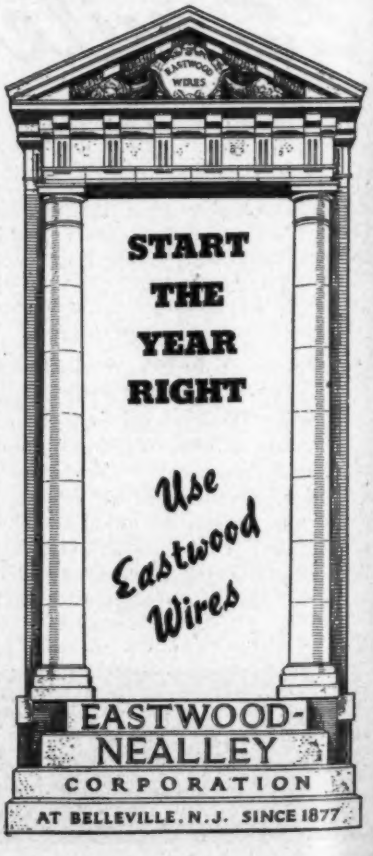

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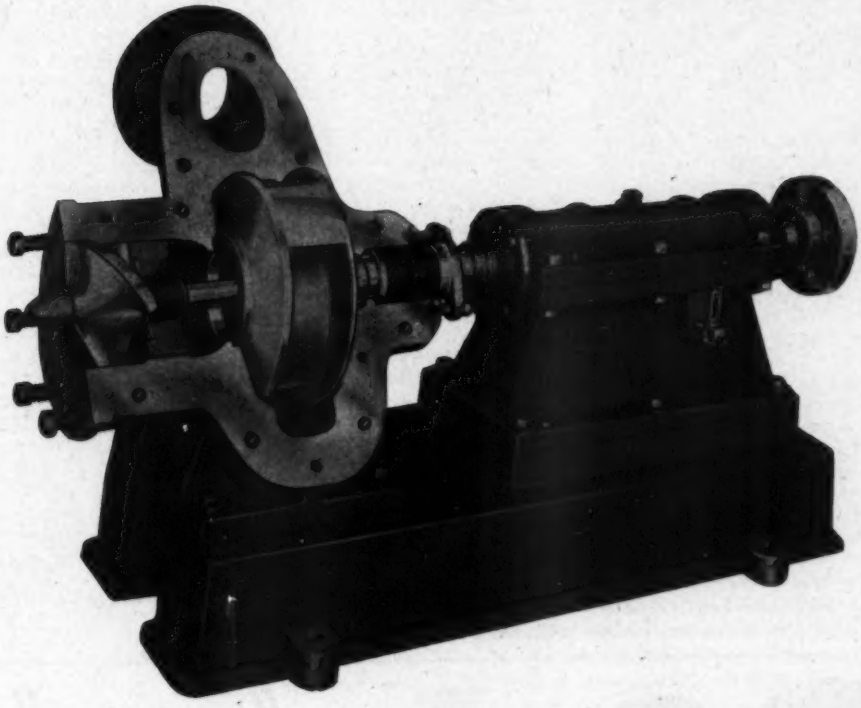

From the illustration above you can see what we mean by "designed for easy maintenance." Note first of all how the entire pump casing may be opened without disturbing the piping. See how the wide impeller openings permit semi-solids and "slugs" to pass freely. Impeller back-plate, flange and vanes are heavy; shaft is over-size, bearings are heavy-duty type.

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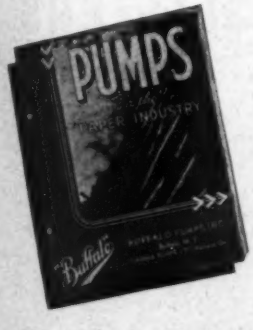

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sought to destroy or emasculate the system in the belief that they would thereby be enabled to pirate with impunity the inventions of their competitors, but who did not seem to realize that a weakening of the system would also destroy their own patent protection.

There were many signs that lead to the conclusion that attacks on the patent system are slackening, and that the system will survive the war without any major changes. A straw in the wind is the fact that several Circuit Courts of Appeal have criticized "the flash of genius test" for invention laid down by the Supreme Court. Another hopeful sign is the fact that the Supreme Court in the last few decisions split sharply on such questions as patent validity and the rights of patentees. Then there is the fact that the President, instead of endeavoring to put into effect the drastic program of patent reform recommended by the Temporary National Economic Committee, appointed a very conservative National Planning Committee to investigate the patent system.

It is very significant that the Commission has presented a very conservative program for patent reform — a program which in certain respects is more conservative than the program of reform sponsored by the National Association of Manufacturers. The recommendations of the Commission are much more conservative than the program adopted by the American Bar Association.

Within the past few years, certain changes were made in the patent laws in an effort to speed up the process of obtaining a patent.

In the postwar period and perhaps even before the war ends, patent procedure will be further streamlined. The Examining Corps of the Patent Office will undoubtedly be increased when the manpower shortage ends. The facilities of the Patent Office for searching the prior art will be improved, the reclassification of patents will be further extended, more technical books and periodicals will be obtained, and the examiners will be enabled to spend more time on each case.

The streamlining of Patent Office procedure and the improvement of the facilities for searching will enable the examiners to act more promptly and more efficiently on applications. Furthermore, in order to prevent dilatory tactics on the part of applicants, the life of patents will be restricted to 20 years after filing, but in no case more than 17 years after issuance.

The Patent Office will probably endeavor to raise its standard of patentability to approach the high standards set by the courts. The presumption of validity of issued patents would thereby be raised, but there is a great danger in raising the standard of invention too high.

If the Patent Office raises its standard too high, the Supreme Court will have very little opportunity to adjust its standard to a reasonable level. For, under present procedure, the validity of a patent cannot be tested until it is granted. Hence, it is an opinion that the Patent Office should resolve every reasonable doubt on the question of patentability in favor of the applicant, and should not apply too strictly the so-called negative rules of invention.

Incidentally the Patent Planning Commission has recommended the enactment by Congress of a declaration of policy that patentability shall be determined objectively by the nature of the contribution to the advancement of the art, and not subjectively by the nature of the process by which the invention may have been accomplished.

The necessity for a statutory declaration of policy may be rendered unnecessary by a swing of the pendulum. As previously stated, several Circuit Courts have criticized the "flash of genius" test of invention, and several of the judges of the Supreme Court in a recent case vigorously dissented from the views of the majority as to the question of patentability. It is within the realm of possibility that the Supreme Court will in future litigation give more weight to the importance of the step taken by the patentee than to the question as to whether or not the invention involved the incandescent spark of genius.

Interference procedure* has been considerably simplified in recent years, but hardly enough to meet adverse criticism. There is no doubt that the Commissioner of Patents and his associates will further simplify and shorten the proceedings.

A committee of patent attorneys is sponsoring a bill (H.R. 3264) to abolish inter-

*An interference is a proceeding in the Patent Office to determine which one of two or more inventors is the first inventor and hence entitled to the patent.

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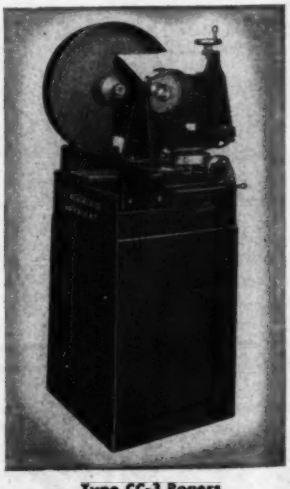

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Greater toughness and higher impact resistance than other commonly used materials account for Monel's splendid performance in this service. In addition, Monel withstands acid and alkaline stocks, alum solutions and brackish mill waters.

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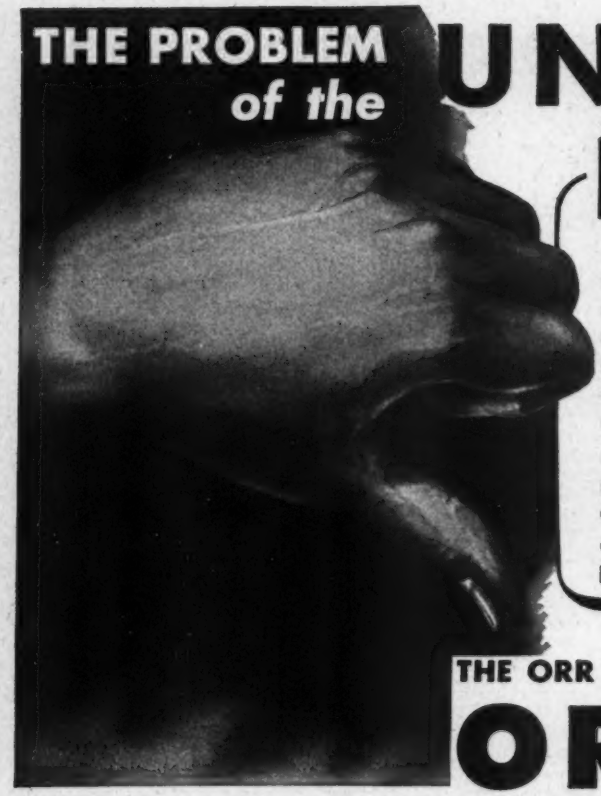

THE PROBLEM of the UNSALABLE PAPER

A mill making paper for condensers found that every time they changed felts, much of the first day's production was lost. WHY—because the new felts were shedding wool fibers into the sheet. To be salable, paper for condensers and other electrical applications must be perfect.

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ORR FELTS

ference proceedings in the Patent Office. The Commissioner would select from the interfering applicants the one to receive the patent, and the others would have to institute court action to cancel the patent and to have a second patent issued.

The proponents of the bill contend that the present interference practice constitutes a bottle neck in the Patent Office and delays the issuance of the patent so that it expires later. The difficulty with the argument is that only a handful of patents are actually delayed because of the present interference procedure, and the adoption of the bill, whereby patents would in no case be granted for more than 20 years after filing, would adequately take care of the situation. Furthermore, since the Commissioner would have to decide without the benefit of any testimony who should get the patent, his decision would at the most be a guess, and a second patent would in many instances have to be issued later, perhaps years later.

There are several particularly bad features in the proposed bill. Applicants would have their applications rejected on pending applications as well as on issued patents, and would be entitled to see the rival application without any provision for safeguarding the prior applicant. The Commissioner would be permitted, as previously stated, to issue the patent to one of the applicants, not necessarily the first, and the unlucky party would have to file suit in the district where the successful party resides.

Under the present procedure testimony is taken before a notary and at the convenience of the parties and witnesses. For instance, the attorneys for the parties may assemble in the office of one of the lawyers or in the plant where the inventor or the witnesses work, and witnesses need be called away from their tasks just long enough to testify. The testimony is submitted to a Board of Interference Examiners, who are experienced not only in technical matters but also in weighing evidence. The parties as a rule have faith and confidence in the Patent Office tribunals, and usually accept their decisions without appeal to the courts. In most cases where appeal has been taken, the original decisions of the Patent Office have been sustained by the courts.

Under the proposed new practice, the unsuccessful applicant in the Patent Office would have to take his witnesses and his exhibits into a strange court, in many cases hundreds or thousands of miles away from his home. In addition to bringing a patent attorney with him, who is familiar with the technicalities of the invention, he would have to hire a local lawyer, whom he does not know and in whom he may have no confidence. The case would be heard by a judge, or a master appointed by the judge, neither of whom would be familiar with the technical subject matter, and there would be interminable delays before a final decision, during which time his rival would have the patent. The expenses connected with the new procedure to say nothing of legal fees would make the proceeding a luxury to be enjoyed only by well-financed corporations and their attorneys.

Appellate procedure from decisions of the Patent Office tribunals will probably be simplified. At the present time, an applicant when he is refused a patent by the Patent Office Board of Appeals may appeal further to the Court of Customs and Patent Appeals or sue the Commissioner in a Federal Equity Court. One of these parallel procedures will likely be eliminated.

A single court of patent appeals may finally be established which will handle appeals in infringement suits from all the eighty-four District Courts. This reform, recommended by the Patents Committee of TAPPI in 1931, will do much toward the establishment of a uniform standard of invention, particularly if the same court of appeals is given jurisdiction of appeals from the Patent Office.

In the more distant future, provision will be made for the revocation or cancellation of improperly issued patents. The Commission recommends that within 6 months after the issuance of a patent, any member of the public be accorded the opportunity to challenge the validity of the patent by means of a cancellation proceeding. At the present time, a member of the public has no opportunity to challenge a patent, unless he is sued or threatened with a suit for patent infringement. The recommended procedure would be in the Patent Office, and would involve much less expense than a suit in court.

The Patents Committee of the National Association of Manufacturers recommends that instead of revoking or cancelling a patent after it issues, pending applications be thrown open to public inspection be-

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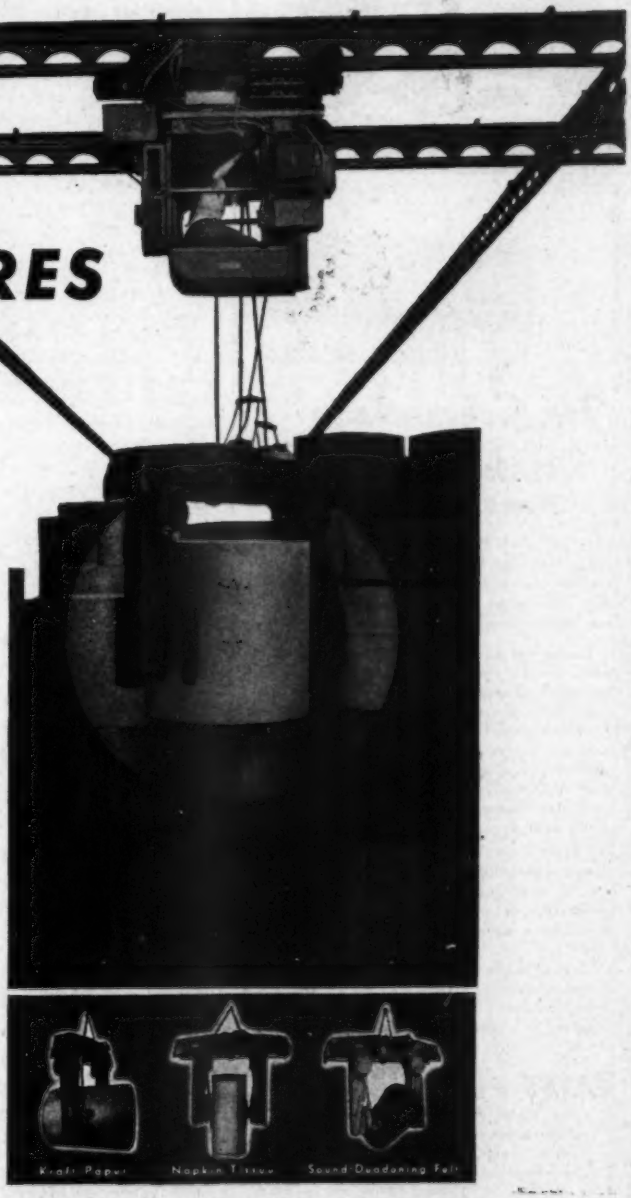

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WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

fore issuance to permit the public to submit evidence against the grant of the patent. This is believed to be a very dangerous practice. There are some companies, fortunately few in number, that originate very few industrial developments of their own, but are always ready to reap where they have not sown. The opening of their competitor's applications would prove a bonanza to this type of company, and correspondingly increase the number of pirated inventions and court litigation. Furthermore, the individual inventors and small industrial establishments would be at a disadvantage, because of the cost of obtaining copies of all open applications in their field of endeavor.

In the postwar world, the Justice Department will undoubtedly continue its campaign against cartels and the illegal use of patents—but with much less fanfare.

The so-called Kilgore Science Mobilization Bill is concerned with patents only indirectly, and hence reference to it is brief. Industrialists and many scientists have been greatly disturbed that the Government will take over all the research facilities of the country. It is an opinion that industry has it in its own power to prevent this by taking the initiative away from the Government. There have admittedly been certain abuses in the past in the use of the results of scientific research, and the excuse as well as the occasion for governmental interference may be obviated in large measure by the voluntary elimination of the abuses.

There has been a recent tendency on the part of many industrial establishments to attempt to protect their inventions as trade secrets. This has been in large measure due to the attacks on the patent system and to the uncertainties of patent litigation. It is believed that the trend in the postwar world will be away from trade secrets and toward patents.

Patents will, therefore, play a very important role in the period that will follow the war, and the industrial establishment that does not adopt an adequate patent policy will be left behind in the postwar race for new products and new processes.

Melamine Laminates

R. H. MALAMPHY

American Cyanamid and Chemical Corp.

The chemical melamine was first synthesized by Liebig in 1834. Melamine is a triazine, the amide of syanuric acid. Liebig's original paper indicates that the prefix "mel" has no particular significance. This chemical remained a laboratory curiosity but in recent years was available through Eastman-Kodak at $40 per pound.

Melamine sublimes at 350 C. while urea melts at 133 C. and decomposes at a slightly higher temperature. Melamine crystals are quite inert and practically insoluble in all solvents with the exception of boiling water, where its solubility is only 5%. Urea is highly soluble in cold water. These same striking differences appear when the heat and water resistance of melamine resins are compared with the urea resins.

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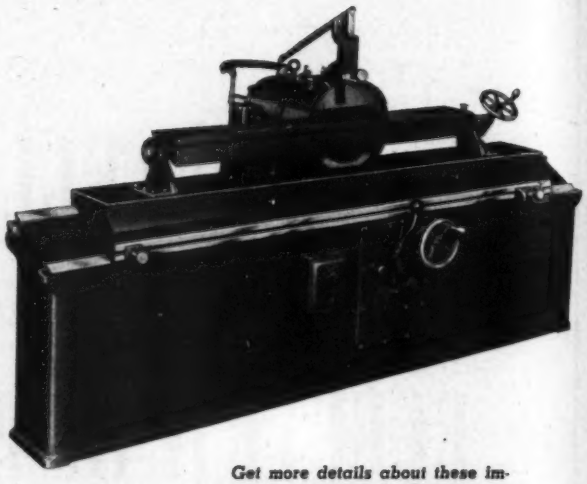

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were attracted to this raw material as a base for synthetic resins. It was quickly found that melamine formaldehyde products had certain properties superior to urea resins. Unfortunately, however, the availability of these resins had to wait for the commercial production of melamine chemical. Melamine resins were introduced to the laminators in 1938 in combination with urea. The first all melamine resins began to be used in substantial volume during 1939. These resins were supplied in the form of a fine, white powder and were prepared for use by dissolving in a water-ethyl alcohol solvent.

Melamine resins are highly popular and are completely water soluble at certain concentrations. The solutions are water clear. Their viscosity is low and most types are reactive at lower temperatures than are customarily used for phenolic resins. They can be cured over a fairly wide range of *p*H and catalysts are not necessary in the laminating process.

The first use to which melamine resins were put in the laminating field was the preparation of decorative sheet materials. Attractive, colored table tops, bar tops, and wall paneling were being installed all over the country prior to the war. There are many logical reasons why high pressure melamine resins have been found to be outstanding for this purpose.

The resins themselves being water-white in the uncured form and resistant to color change in the cured form permits their use for white, light pastels, or any color combination imaginable. For such applications, resistance to abrasion is very important. No other plastic material has yet been developed which has the hardness of melamine resins for its mar resistance. As it is a thermosetting resin insoluble in alcohol, acetone, or common organic solvents used for cleaning, there is no concern about damage if one is careless with his drinks.

Light colored melamine laminates have been produced in the laboratory which were undamaged by burning cigarettes, cigars and matches. The heat resistance here plays an important role even though it is commercial practice to incorporate a thin sheet of conductive metal below the surface to dissipate heat. As melamine resins are somewhat more expensive than phenolic resins, it is customary to use the cheaper resins in the core; that is, in the manufacture of a decorative panel, plies of phenolic impregnated paper are built up to the approximate thickness and at least two or more melamine resin treated sheets are placed on the surface. It is often desirable to balance the assembly by bonding melamine sheets to the reverse side to assure maximum dimensional stability.

The paper used in such a construction is of various types. The core paper is an ordinary absorbent kraft; the barrier sheet applied directly to the core is usually alpha cellulose and preferably pigmented. This sheet is necessary to prevent the dark phenolic resin from bleeding through to the surface sheets. The decorative sheet is a pigmented paper either in solid color or printed patterns. Linen finish or photographic reproductions of marble and wood grain have been very popular.

In order to develop depth of color and maximum abrasion resistance, the use of a thin, alpha-cellulose or rag paper as a top sheet is essential. This paper should be as uniform in formation as possible for its function is as a translucent overlay. The overlay sheet used is from 1 to 3 mils in thickness and is impregnated with a very high percentage of melamine resin. It is not transparent, but when cured under high pressure, it becomes a transparent surface film.

Beautiful results are achieved with pigmented and with patterned papers. Unfortunately, at the present time, all white pigmented papers produce a gray white and are not comparable to a baked Melmac surface coating. Therefore, it is necessary to apply a resin pigment mix by spraying or roll coating on the paper to develop the intense white desired for most household applications.

During the war, melamine resins have been widely used for the production of nameplates, graphic charts, and engraving stock. A large quantity of schematic wiring diagrams and instruction charts have been made for suppliers of equipment to the armed services in which melamine has been used throughout. Fluorescent laminates of this type have been widely used in military aircraft enabling the pilot to read his dials, instruments, and nameplates in the dark.

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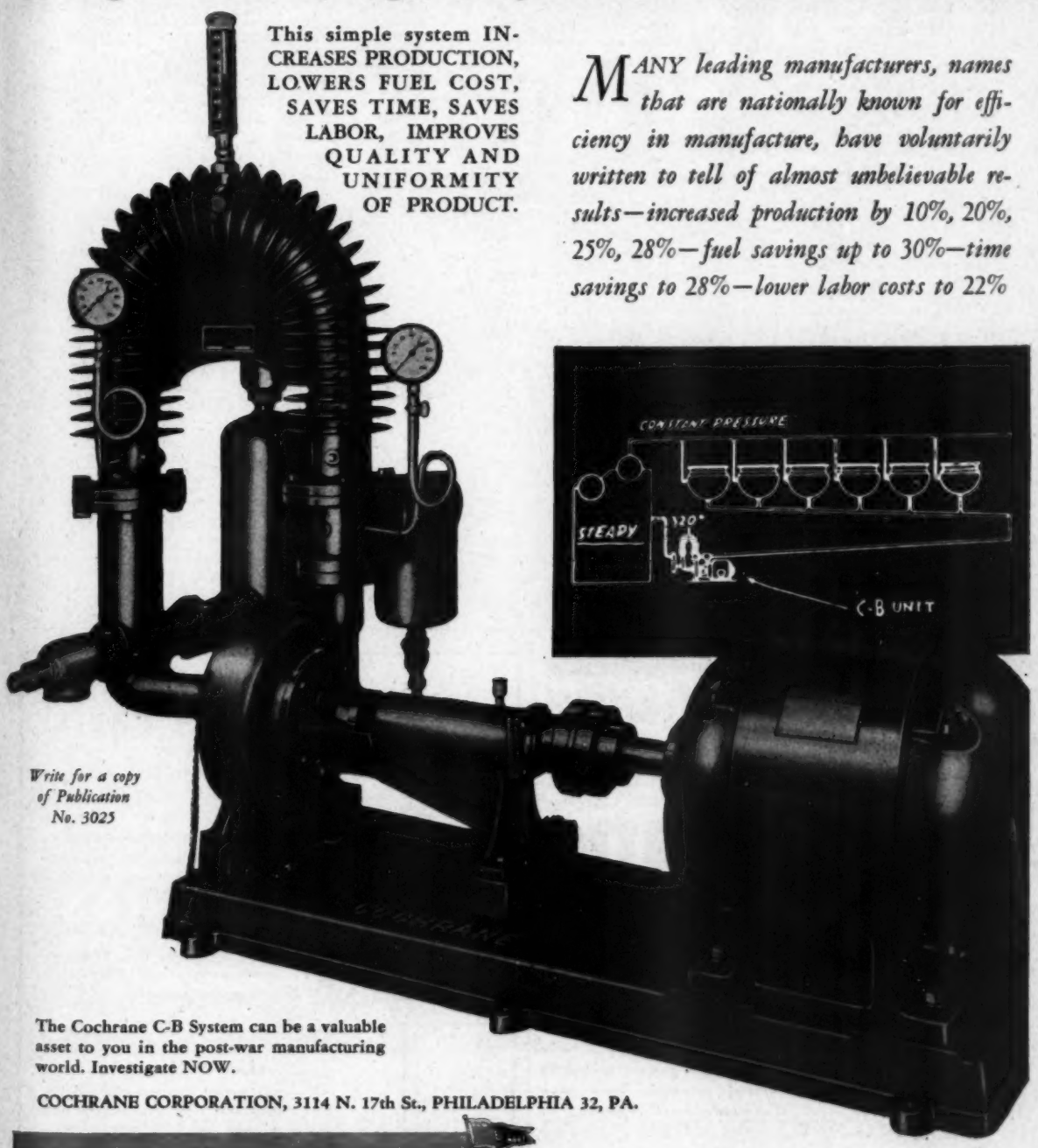

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Engraved stock is prepared by using either a black core with white surfaces or the reverse. Letters and numerals stand out by engraving through to the contrasting color.

Unmodified melamine resins have been used to a limited extent for kraft paper laminates, but their scope is somewhat restricted due to brittleness. This material has a high degree of arc resistance at low current densities.

A great variety of pigmented, patterned, and photographic reproductions on paper will be required in the postwar market. Certain companies in the paper industry are producing excellent special papers. It should be emphasized that the actual tonnage involved is not large and that many small special orders must be filled by the paper manufacturer to properly service its customers in this field.

If approximately 3% of a melamine resin acid colloid is incorporated, the absorbency of the paper is not appreciably affected but it is over 60% as strong when wet as when dry. There is improved wet rub resistance and the paper has not been embrittled. The dry tensile strength has been improved and it can be folded repeatedly without fracture. This melamine resin treatment of paper has not only simplified its use by the laminator but has opened applications for paper where it has previously been excluded due to the great loss of strength upon becoming wet. Even at high humidities and elevated temperatures, this improvement is retained after long storage.

Glass fibres in the form of fabric or mat are available for impregnation which can be bonded with melamine resins to give outstanding properties. The glass fiber has remarkable physical strength and in combination with melamine, can be used to very great advantage.

Asbestos papers and fabrics are used in great variety. Melamine resins are highly compatible with asbestos and produce excellent heat resistant laminates as they readily cure at a high *p*H.

Cotton fabrics ranging from light muslins to heavy industrial ducks have been used for a variety of applications. A matrix for asbestos shingles is a typical example. The melamine laminate is used in this case because there is no danger of staining the white shingle during molding and since the high abrasion resistance gives durability permitting many thousand impressions from one matrix.

Considerable exploratory work has been conducted with rayon and a variety of synthetic fibers. It may be that some of these are in actual commercial use.

Modified melamine resins are available for low pressure laminating. These have adequate flow for good bonding at 50 psi pressure. They impart excellent rigidity, heat resistance, and water resistance.

One of the most interesting uses for melamine resins, which may be of great importance postwar, is the impregnation or surfacing of plywood. A paper impregnated overlay of melamine resin is pressed on during the hot bonding of the plywood, at the usual 250 psi pressure. The wood grain is brought out through the translucent sheet giving a very attractive appearance. As is the case in making ordinary laminates, the finish depends on the plate used against the surface. In other words, a glossy sheet of metal will impart a lustrious finish while a dull plate will produce a mat finish. Handsome, durable plywood can be produced in this fashion by surfacing irregular and low cost cores with select, thin veneers and a melamine paper top sheet.

There is a possible market also for papers of greater thickness and a less rigid quality requirement, for surfacing cheap plywood where outdoor durability is needed without consideration of appearance. In this case, the wood grain shows through due to the pressure on the high spots of the rough cut veneers. Comparative tests at Forest Products Laboratory and elsewhere have shown that melamine resins are unexcelled in outdoor durability.

There is confidence that the outstanding properties of melamine laminated plastic will lead to even greater use for wall paneling, table tops, bar and counter tops. The refrigerator industry has used substantial quantities for breaker strips and door liners in the past and will, undoubtedly, resume the use of melamine-paper base laminates when production is again authorized.

It is felt in some quarters that a variety

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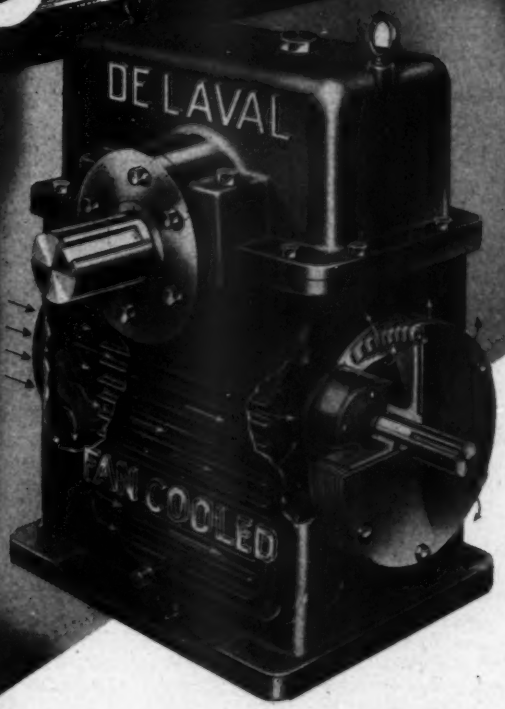

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of household applications, including fixtures and equipment for the bathroom and kitchen, will be developed. There is, undoubtedly, a great potential market in the lighting field for translucent materials. Store fronts are another practical possibility. The automotive, aircraft, and railroad industries will, undoubtedly, find numerous uses for this laminated material when new designs are inaugurated.

High Strength Phenolic Paper Laminates

G. K. DICKERMAN, Technical Director Consolidated Water Power and Paper Co.

Prior to the last year or two, the chief interest in the use of paper as a base for laminates in the plastics industry was restricted to electrical and decorative applications. Impregnated or coated with phenolic, urea, and more recently, melamine resins, paper-base laminates have long been familiar to all as electrical insulating panels and attractive, serviceable table tops. Although such applications added up to a substantial item in the laminating field, the total amount of paper consumed was not sufficient to be of very general interest to the paper industry as is indicated by the lack of references in the literature.

The use of paper base laminates as a structural material was handicapped almost to the point of non-existence by high cost, the difficulty of manufacturing and fabricating, and perhaps of greatest importance, by disappointing strength values in relation to the specific gravity of the material. It is significant that for all commonly used structural materials from wood through to steel, the ratios of tensile strength and elastic modulus to specific gravity approach constants. A glance at the strength properties listed for the commercial grades of paper base laminates a few years ago will indicate why design engineers gave them scant consideration.

In 1939, one of the aircraft companies which had engaged in several years' study of various laminating materials proposed that paper laminates of improved strength characteristics might find structural applications in aircraft (Marsehner, C. F., Structural considerations favoring plastics in aircraft structures, *Modern Plastics*, September, 1939).

The Forest Products Laboratory with the co-operation of the Consolidated Water Power and Paper Co. and other agencies, military and private, promptly undertook a fundamental investigation into pulps, papers and resins. Their findings must remain largely unpublished until after the war, but from this work emerged the commercial development of high strength Mitscherlich paper base laminates such as laminated Consoweld.

Mitscherlich spruce sulphite has long been known as a pulp which develops rapidly with a minimum of mechanical treatment to produce a sheet of paper with exceptionally high tensile strength. This is the basic requirement for a high tensile laminate since the strength of the laminate derives chiefly from the strength of its filler stock.

Unfortunately all too little is known of the fundamental factors involved in making a strong sheet of paper. The highest strengths in proportion to weight are not generally obtained on sheets heavier than 35 pounds ream weight.

To obtain a satisfactory resin impregnation in the treating operation, the sheet must be unusually uniform in caliper and basis weight both with and across the machine and the degree of absorbency must be closely controlled.

Experience has shown that a sulphite sheet of 0.65 specific gravity treated to a resin content of 35 per cent will mold to a specific gravity of about 1.38 using a molding pressure of 250 pounds per square inch. The percentage of voids at 1.38 specific gravity is sufficiently low to give a good balance of physical properties but below 1.35 specific gravity, factors such as water absorption and compressive strength deteriorate.

The paper should preferably be impregnated on a treating machine of the dip and squeeze roll type. This allows the use of a varnish with a minimum of solvent and helps to drive the resin into the sheet. Precise control of resin content is obtained through adjustment of the squeeze roll nip.

Drying of the treated sheet involves a partial polymerization of the resin as well as removal of solvent. Since temperatures of over 275 Fahr. for a period of about a minute are required to advance the resin to the desired stage, it is evident that a

Good Formation

at the Wet End...

Tending a paper machine is much like tending a baby—most of the troubles begin at the wet end. This explains why experienced paper manufacturers equip the wet ends of their machines with Hamilton Felts. There is mighty little wetness left in a sheet when it leaves a Hamilton Felt and begins its journey to the winder and slitters. In fact, it is so dry and so well formed that the finishing process requires little time and less steam. Broke is insignificant.

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long tunnel is necessary to maintain production on the comparatively light sheet. Best drying results are obtained through the use of graduated temperature zones, starting with a temperature of about 260 Fahr. and working up.

The amount of volatile matter left in the treated sheet is determined by the desired resin flow at the specified molding pressure. The best properties are generally obtained by reducing the flow to a point just above that required to fill the voids. Excess flow not only detracts from the strength properties but results in a messy laminating operation.

Uniformity in physical properties is essential in any material to be used for structural purposes. In producing synthetics of all kinds, one of the most effective methods of wiping out minor variations is through blending. This principle is put to good use in the preparation of treated paper for laminates by multiple sheeting. By cutting six or eight rolls at a time, thickness, and other properties are held to extremely close tolerances.

Flat panels can best be laminated in multiple opening steam heated flat presses. The distribution of pressure must be uniform. Temperatures should be held close to 300 Fahr. and the panels may be pulled hot.

Flat presses may also be used for molded shapes. Because of the low molding pressure requirements for this type of paper, low cost dies such as cast Kirksite are satisfactory. However, because of the limited amount of stretch in paper, the sheets must be tailored to produce compound curves of low radius. On production runs, tailoring can be scientifically designed and economically done using steel rule dies on a flat bed or cylinder press.

On some types of jobs where it is impractical to design suitable dies, various bag molding or fluid pressure techniques can be used to advantage. The molding pressure requirement of the treated paper is an important factor in this type of work.

Post forming as it has developed in the aircraft industry provides another method which can be used to advantage on some shapes. The laminating is done in a flat sheet but the cycle is adjusted to leave the resin incompletely cured. At this stage, it is thermoplastic and on reheating can be shaped to curved forms with very little pressure.

In all forming operations involving compound curves, paper is difficult to handle because of its lack of stretch. Some very difficult forms have, however, been worked out and even where tailoring is involved, the use of paper is frequently justified by the low raw material cost and the strength and stiffness characteristics of the final product.

The types of structural uses fall into three general classes. Frequently as in the case of ammunition boxes, the most practical method is to glue together simple structural shapes such as flat pieces, angles and channels, all of which can be readily formed on flat presses with simple dies. Most of the commonly used types of synthetic resin glues can be used satisfactorily providing the gluing surfaces are lightly sanded. Care must be used to ensure adequate glue line pressure because of the noncompressibility of the laminate but this is not ordinarily too difficult.

A second type of application is to mold the unit as a whole. Generally, the shape and size of the piece and the length of the run will determine the molding method to be used.

A third application is in combination with other materials such as wood. Again molding pressure requirements are important since the paper can be laminated and bonded to the wood in one operation at pressures which will not crush the wood. In such applications the paper provides a hard, splinterproof surface and protects the wood against moisture absorption. As an example, a floor of basswood faced on both sides with paper (Consoweld Sandwich Floor) has replaced a combination wood-metal floor in one of the large cargo planes.

Having achieved commercial production of the high strength laminates, the big job of evaluating its properties in comparison with other structural materials was begun. Because of the urgency of the task, this work was shared with private laboratories by the Forest Products Laboratory, the Air Corps Materials Laboratory at Wright Field, the Aeronautical Materials Laboratories at the Naval Aircraft Factory and others. Although much remains to be done, a considerable amount of data has already been published (Fuller, Major F. B., Engineering of plastics, *Modern Plastics*, June, 1943; Field, P. M., Basic physical properties of laminates, *Modern Plastics*, August,

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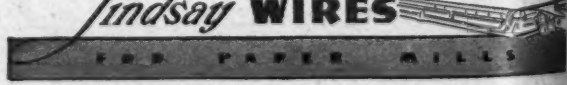

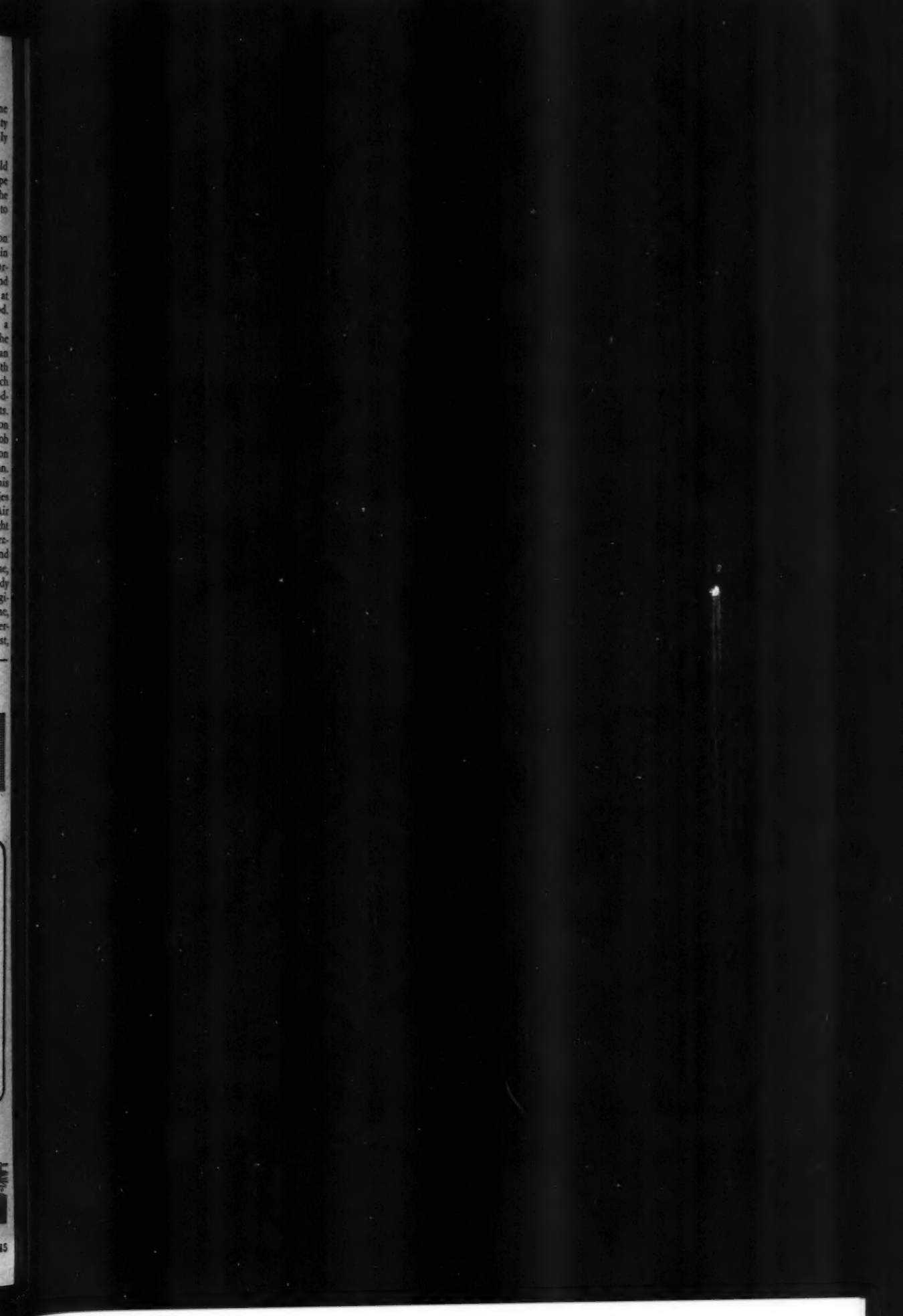

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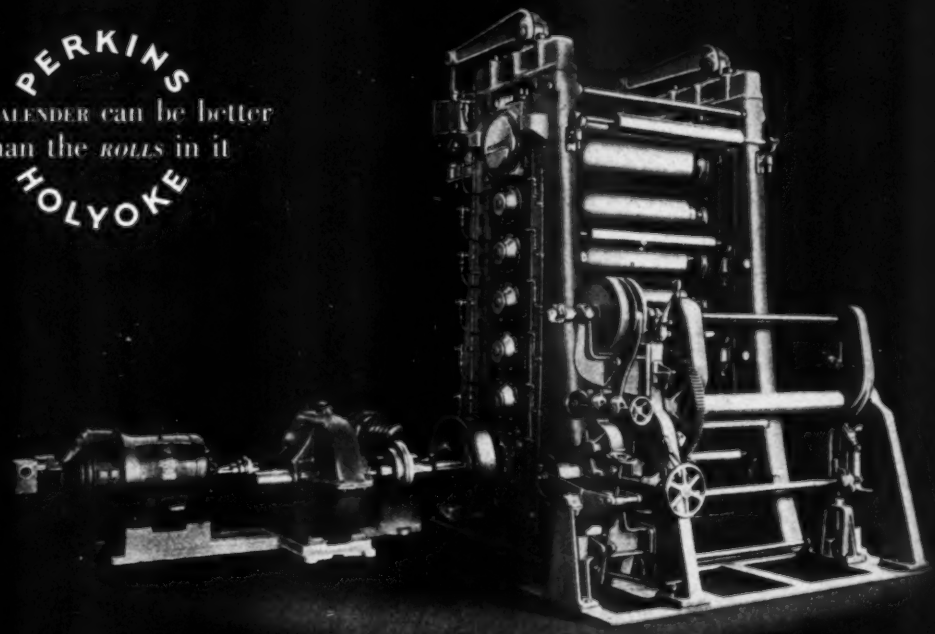

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1943; Sang, Henry, and Field, P. M., Evaluation of high strength plastics, *Modern Plastics*, October, 1943). Some is already obsolete because of improvement of the material.

Table I shows some of the more important properties. This data is based on hundreds of tests made on commercial production runs over the last year. The figures are conservative minimum values which may safely be used for design purposes. They are based on material molded under the standard conditions of 250 psi molding pressure with a cycle for ⅛ inch thickness of 12 minutes at 315 Fahr.

Men accustomed to working with metal have criticized paper laminates for lack of ductility. The elongation before rupture is not comparable to a ductile metal and there seems to be no way of stretching the fibers or fiber bonds without losing desirable strength characteristics. Thus paper laminates, even though adequate in strength-weight ratios cannot generally be substituted for metals without some redesign. This is particularly true in the fastenings which in metal generally depend on ductility to a considerable extent to distribute stresses. That the problem is not too serious is evident when it is realized that wood, the most commonly used of all structural materials, is also one of least ductile.

TABLE I—Engineering Properties of a Paper Base Laminate

	Type I Cross Laminated	Type II Parallel Laminated
Specific Gravity	1.38	1.38
Tension		
Ultimate, psi	26,000	36,000
Elastic modulus, psi	2,300,000	3,000,000
Compression		
Ultimate, psi	18,000	19,000
Elastic modulus, psi	2,200,000	3,000,000
Flexure		
Modulus of rupture, psi	26,000	36,000
Elastic modulus, psi	2,000,000	3,000,000
Shear		
Edgewise, psi	14,000	15,000
Flatwise, psi	14,000	15,000
Bearing		
Edgewise, psi	30,000	30,000
Water Absorption		
⅛ in. x 2 in. x 2 in. (unsealed edges)	2-2½ %	
⅛ in. x 2 in. x 2 in. (sealed edges)	1-1½ %	
Gasoline and oil absorption	Not affected	

Notes—(1) The above values may be used for design. (2) All values except Bearing in accordance with Fed. Spec. L-P-406.

Paper laminates are also criticized for brittleness. Although the high strength laminates are considerably tougher than the previous electrical grades, it is true that thin sheets are subject to fracture under a sharp impact. The resin is at least partly responsible for this, and it is hoped that the resin manufacturers will assist in producing a product with better impact resistance. It is known, for example, that a laminate containing a high proportion of lignin is generally more resistant to impact than a straight phenolic laminate. At the present time, when greater toughness is desired in thin sheets, it can be obtained with a moderate sacrifice in strength and stiffness by laminating paper with resin impregnated fabric.

In conclusion, it appears that in the recently developed high strength paper laminates, a material made chiefly from paper is had which has sufficiently high strength characteristics to place it in the field of common structural materials. Although the present field of application is small, it is increasing at a rate which should accelerate as wartime restrictions on the use of resins are relaxed and various industries become more familiar with the potentialities. The paper industry will do well to keep an eye on this development as a possible outlet for substantial quantities of paper and possibly other products of pulp manufacture.

The Effect of Small Chips Sizes in Sulphate Pulping
I. Effect of Chipper Fines

K. G. CHESLEY[1], and N. F. ROBERTSON[2]

Chippers are commonly operated with two main objectives. The first is to produce the optimum amount of the most desirable chip size and the second is to produce as little "sawdust" or waste chipper fines as possible. This objective is made difficult of attainment because of the lack of data in the literature on the effects produced by and the relative value of the various chip sizes. This is particularly true for the sulphate process. Morgan and Dixon (*Tech. Assoc. Papers* 21, 364, 1938; *Paper Trade J.* 107, 38, Aug. 18, 1938) have found that chip length is an important variable in the sulphate process. They found that short chips are overcooked before the longer ones have been pulped

(1) Director of Research, and (2) Research Chemist, Crossett Lumber Company.

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to a sufficient degree. In their tests, the permanganate number varied from 6.4 for ½-inch chips to 20.9 for 1¼-inch chips when the penetration time was 1.5 hours and from 7.3 to 14.3 when the penetration time was 4.5 hours. On the other hand Cable, McKee and Simmonds (*Tech. Assoc. Papers* 10, 29, 1937; *Paper Trade J.* 83, 115, September 30, 1926) have shown that when cooking aspen, birch and maple by the soda process, the length of the chip between the limits of ½-inch and 1¼-inch has practically no influence on the yield, bleach required, or loss in weight on bleaching.

There is even less information on the effects and relative value of chips below ¼-inch in length or the fine material from the chipper which is normally removed by screening. The statement that "they consume chemical and contribute only debris to the pulp" is common. This is a misleading statement and contributes little to the understanding of the whole problem. There are many obvious reasons why the production of these chipper fines should be kept at a minimum. There is no reason to assume, however, that under no condition could the material have any value. Another point which is stressed repeatedly in the literature is the importance of uniformity of chip size (*Cellulose and Cellulose Derivatives*, page 480, Interscience Publishers, Inc., New York, 1943); although the fact that in some instances non-uniform chip size might be desirable to impart certain properties to the pulp (Sutermeister, E., *Chemistry of Pulp and Papermaking*, 3rd ed., page 97, John Wiley & Sons, New York, 1941) has been mentioned.

This contribution is confined to a study of the effect of rejected chipper fines produced in one commercial plant operating normally on a mixture of about two-thirds loblolly (*Pinus Taeda L.*) and one-third shortleaf (*Pinus echinata Mill.*) pine. The term "chipper fines" is defined as the material coming from the chipper which will pass through a ¼-inch screen. "Retained chipper fines" is used to describe the material passing from the screens to the digesters which will pass through a ¼-inch screen, and "rejected chipper fines" the material rejected at the screens which passes through a ¼-inch screen. These terms are used instead of the customary term "sawdust" because it is believed that they more adequately described the material. Then, too, there is some interest in the pulping of actual sawdust from sawmilling operations at the present time which necessitates a revision in terminology to prevent confusion.

Sixteen batches of chips and nine samples of rejected chipper fines were taken from the mill supply over a two months period as needed.

The cooking conditions under which the chips and rejected chipper fines were cooked are as follows:

Digester charge.....4000 grams moisture-free basis
Liquor ratio.....3.33 to 1 (40 gal./100 lb. of chips)
Active alkali .....17.2 to 20.8%
Black liquor .....2000 ml. (except when dilution prohibited)
Time to 212° F. (100° C.)..... 15 minutes
Time to 338° F. (170° C.)..... 75 minutes
Time at 338° F
  60 minutes for 30 permanganate number pulp
  120 minutes for 20 permanganate number pulp
Total cooking time;
  135 minutes for 30 permanganate number pulp
  195 minutes for 20 permanganate number pulp

Water injection
  2688 ml. or 67% basis moisture-free chips (0 to 55 mins.)
  720 ml. or 18% basis moisture-free chips (55 to 80 mins.)
  520 ml. or 13% basis moisture-free chips (80 to 135 mins. for 30 permanganate number pulp)
  680 ml. or 17% basis moisture-free chips (80 to 195 mins. for 20 permanganate number pulp)

Digester relief
  160 ml. or 4% basis moisture-free chips at 212° F.
  160 ml. or 4% basis moisture-free chips at 50 lb. pressure
  80 ml. or 2% basis moisture-free chips at end of cook

Eight series of cooks were made:
  No. 1—100% laboratory standard chips
  No. 2— 25% rejected chipper fines mixed with 75% standard chips
  No. 3— 50% rejected chipper fines with chips
  No. 4—100% rejected chipper fines
  No. 5—100% rejected chipper fines (retained on ¼ inch screen only)
  No. 6— 25% rejected chipper fines (on ¼ inch screen only) with chips
  No. 7—100% rejected chipper fines (on ¼ inch screen only and containing low per cent bark)
  No. 8— 25% bark (passing through ¼ inch screen) with chips

Three cooks each to permanganate numbers 30 and 20 were made in Series 1 and 4. Two cooks each to permanganate numbers 30 and 20 were made in Series 2, 3, 5, and 7. Two cooks to a permanganate number of 30 were made in Series 6.

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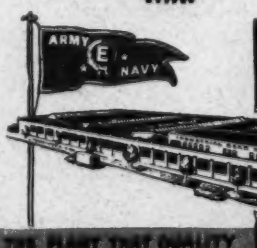

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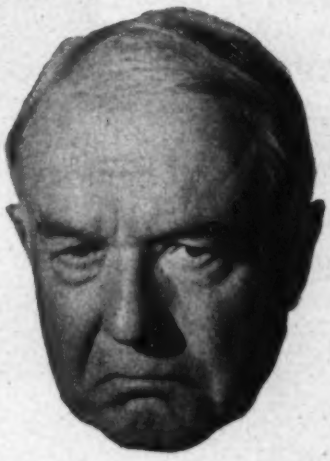

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Think it over, fella. Then get in there and fight. Read—and observe—the four rules to head off inflation. The war isn't over yet. And the war against *inflation* isn't over yet—by a long shot. Remember World War I? The cost of living rose twice as fast *after* the war as it did during the war itself.

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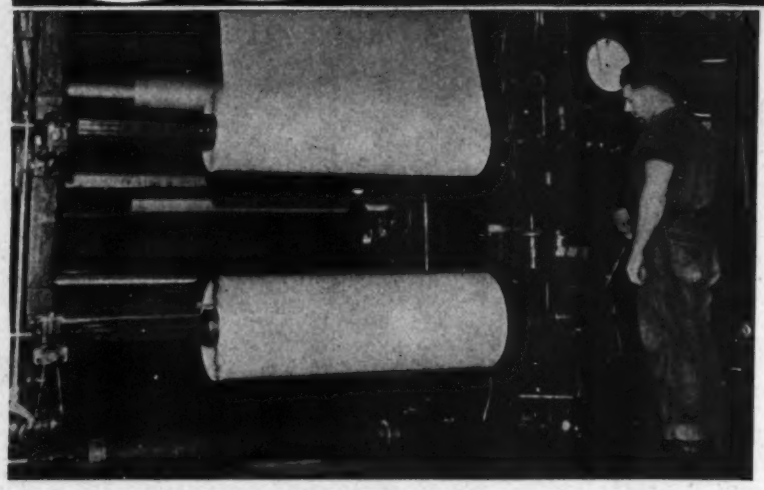

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Permanganate numbers were made, according to TAPPI Standard 214 m-42, using 50 ml. $KMnO_4$.

A 1½-pound valley beater was used to make the pulp strength tests as described in TAPPI Standard T 200 m-43, except for the following: a 6500 gram weight was used on the bed plate, and 1000 ml. samples were removed for testing at 5, 25, 45, and 65 minute intervals. The sample was not cleared before making the sheets. Five sheets for each interval were made on a 7¾-inch diameter, Valley sheet machine, using a 100-mesh wire and were pressed according to TAPPI standards. The sheets were dried and conditioned at 50% R.H. and tested according to TAPPI Standard T 220 m-42, except that four tears on four sheets were made for the tear test. A basis weight of 25 by 40—500 was used.

In the sulphate pulping of southern pine, under the conditions investigated, it is concluded that rejected chipper fines passing through ¼-inch and retained on ⅛-inch screen and having 1.5% or less bark will produce approximately 93% as much pulp as ordinary mill chips.

Rejected chipper fines from one commercial operation, including all the material which will pass through a ¼-inch mesh screen, produced 80% as much pulp as ordinary chips.

There is no noticeable difference in the yield obtained from rejected chipper fines when pulped alone or in mixtures with regular chips.

The extra alkali needed to pulp chipper fines is due entirely to the bark in the fines. Bark-free rejected fines would consume no more alkali than chips alone.

Rejected chipper fines produced in good chipping operations with bark kept to a minimum should have a negligible effect on normal pulp strength and quality.

Additional Weight Factors of Pulps

JOHN H. GRAFF, Research Associate
The Institute of Paper Chemistry

In 1940, the author (Graff, John H., *Paper Trade J.* 110, no. 2:37-40, January 11, 1940) published an article on the weight factors of beaten pulps, giving a summary of the weight factors obtained up to that time, together with a table of proposed weight factors for coniferous and deciduous fibers (which has been included in TAPPI Standard T 401-m) and tentative suggestions for factors to be used for flax, esparto, hemp, manila, jute, straw, cane, bamboo, and mitsumata.

Since that time, certain new pulps (Asplund Defibrator and Chemipulps, as well as gumwood chemical pulps) have come into use; also, it was thought necessary to reinvestigate the weight factors of straws, and certain bast and vascular bundle fibers; therefore, TAPPI obtained the consent of The Institute of Paper Chemistry for the writer to make an investigation of the weight factors of these pulps.

Based upon the results obtained in this and former investigations, the factors given in Table III should be used for determining the fiber composition (by weight) of a paper furnish.

TABLE III—Standard Weight Factors

Rag	1.00
Groundwood	1.30
Coniferous Fibers	
Asplund Defibrator and Chemi pulps	1.91
Western sulphite	1.33
Unbleached and bleached sulphite and kraft	0.90
Southern kraft	1.57
Alpha	0.70
Hardwood fibers	
Asplund Defibrator and Chemi pulps	1.36
Gumwood chemical pulps	1.03
Soda	0.50
Sulphite	0.60
Kraft	0.70
Alpha	0.55
Straw Fibers	
Bagasse (Asplund Defibrator or Chemi pulps	1.58
Straw (Asplund Defibrator or Chemi pulps)	0.53
Raw straw	0.44
Unbleached and bleached straw	0.36
Cane (unbleached and bleached)	0.75
Bamboo (unbleached and bleached)	0.58
Esparto (unbleached and bleached)	0.51
Flax (unbleached and bleached)	0.49
Flax hurds	0.35
Jute (unbleached and bleached)	0.55
Manila and Sisal (unbleached and bleached)	0.61
Ramie	0.51
Japanese Fibers	
Mitsumata	0.33
Kozo	1.33
Virgin cotton linters (unbeaten)	1.50

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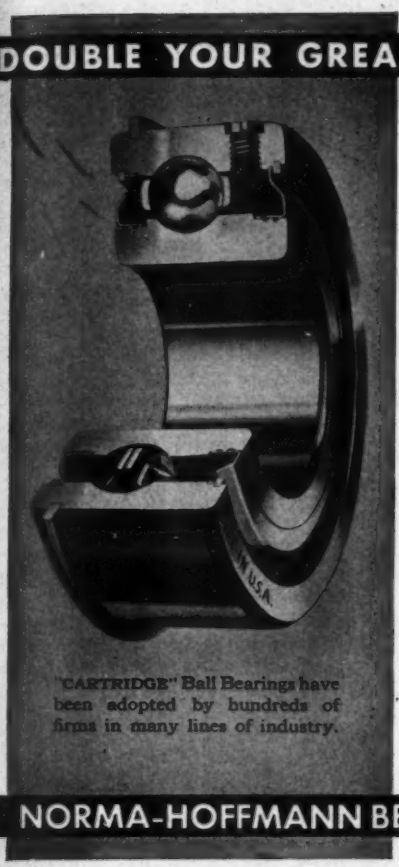

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Discussion of Stock Preparation*

DWIGHT E. JONES

In Charge Engineering and Manufacturing
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Let us examine first the Hollander beater —that machine which was invented by the ingenious Dutch about 1750 to replace the crude inefficient stamping mill. There must have been something pretty good about this machine, otherwise we would not have retained it for nearly two hundred years. To be sure, the machine has gone through considerable evolution, made possible principally by the development of materials. Just for example, at one time the size of a roll in a Hollander was limited to the largest tree butt that could be found. The use of a piece of log for a roll has been discarded within the last one hundred years. I presume that there is no piece of equipment that has been used for stock preparation equipment that has had as much thought, that has had as much condemnation, as the plain old-fashioned Hollander beater. Yet in its history, it has been used for all kinds of purposes, first, of course, in the preparation of the almost universally used rag fiber, later as a pulper, for the breaking up of sheets and laps of various kinds of wood pulp and then continuing in its function as a beater. In fact, the possibility of adapting it to all kinds of situations is today one of its chief advantages. We recognize its disadvantages as being low in over-all efficiency and limited strictly to batch operation.

Next, let us examine Jordans and Refiners. I use the term as synonymous. As far as I can learn, the disk refiner was the first machine, brought out by Kingsland in 1856, and the conical refiner as made by Jordan and Eustice followed in 1858.

The disk refiner, because of its parallel adjustment of the disks, theoretically meant that the bars in both rotating and stationary element would wear uniformly and parallel and at all times present the ideal type of bar relationship. However, this must have been better theory than practice because invariably the disk refiner ended up in failure, possibly due to the difficulty of maintaining parallelism of the disks, or the problem of retention of fibers in the working areas. In the disk refiner, the minute a particle of fiber is accelerated, the power of centrifugal action takes hold and tends to move these fibers in a hurry out of the area and unless extraordinary means are taken much of the bar surfaces may be left unprotected. Another difficulty encountered in the development of the disk refiner, was to generate sufficient endwise pressure so that the fibers could be treated properly. Some of these disadvantages of the disk refiner were not encountered in the conical machine because it was comparatively easy to get reasonable mating of the stator and the rotor, and once attained the contact remained with a reasonable degree of accuracy. Also, the effect of centrifugal force or pumping action is very much lower so that fibers are retained to protect the working edges, and it is comparatively easy to set up sufficient pressure to do the necessary work because one pound of force applied on the end of the plug resolves itself into a force of many pounds perpendicular to the bar edges. However, the conical machine has one serious defect which is very seldom overcome even today, and that is the change in relationship between the stationary and the rotating bars with wear. Because of the unbalance of metal in the various sections, there is a tendency to gradually wear the conical surface wavy. When this occurs, there are areas of excessive high pressure while others have excessive low pressure, and it is impossible to get the best work out of such a machine.

Since the invention of these refiners, we, of course, have had the machines combined, the theory being that one machine would have all of the advantages that both had individually and they would overcome each other's defects. The result, however, as we all know, was a maintenance man's nightmare.

Now, let us examine briefly the advantages and disadvantages of a refiner as compared to a beater. First of all, the refiner is a continuous machine and in certain

(*) Abridgment of paper presented before joint meeting of New England TAPPI and Connecticut Valley Superintendents Association, October 7, 1944, at Pittsfield, Mass.

respects this is a very definite advantage although not always, as in many places it is desired to have batching for the purpose of thorough and active blending. In general, the refiner may be more effective for final lowering of freeness and hydration of stock, particularly in the utilization of floor space if not in the use of power. There is a definite reason for this. Almost always the knives or bars are placed much closer together so that more power can be used per inch of length and we should expect far more rapid action to take place. Some of this same benefit can be accomplished in a beater by putting in more bars in the roll and adding greater bed plate width. For certain kinds of stocks to get best results this necessitates transferring stock from one beater to another, a practice that is not looked upon with favor in this country but used extensively in Europe. To summarize then, the advantages of a refiner are the continuous feature and the greater amount of work it can turn out for a given floor space. Let us explore some of the disadvantages in comparison.

In the case of the refiner, regardless of whether it is conical or disk, the refining action is not uniform over the bar length because of the change of speed. In the case of a beater roll, the bars are moving exactly the same peripheral speed for their entire length and we can expect from each inch of length the same kind of work. Also, in the case of the refiner, it must do all of its work once through and the only control that a papermaker has at his command is to adjust the plug, or more scientifically to change the operating bar pressures. As a general rule, he does not even have the possibility of changing the quantity because he must deliver what is required for the machine. He is at a disadvantage to produce always the kind of qualities that he may require, whereas, handling the stock in a beater he has got at his command the possibility of changing the bar pressures from beginning to end of the cycle so that he may treat his stock more or less drastically as he learns what will produce for him the best results. The stock passes through the refining elements several times; in a good beater at the average of once every three to five minutes. An hour or two in the beater may be equivalent to many continuous machines set in line. With the added possibility that, in the beater, the fiber has an opportunity to soak briefly in water after it once passes through the refining area before it is again subjected to this same treatment.

Now, that we have examined some of the basic machines used to prepare fibers, let us examine some of the theories that have been advanced for fiber development. Frankly, the only one that I find that satisfies me is the "Fibrage Theory" presented by Dr. Sigurd Smith—that Danish Engineer. To those who have not read Dr. Smith's book recently, I suggest that it might be worth reviewing. Dr. Smith, to get to his theory, observed that when a square rod passed through stock at certain uniform rates with one of the edges forward, that fibers straddled this edge and were retained on the bar. His experiments lead him to certain definite conclusions:

1. That the weight of fibers that straddled this edge depended upon the consistency of the stock and were greater with a higher density.

2. That a certain minimum speed was required to accomplish satisfactory deposit of fibrages and he determined that 1,500 to 1,900 ft. per minute were about the minimum at which he could accomplish results satisfactorily.

3. From other observations which he made, he concludes that the fibrages are formed along the leading edge of the bars in a beater or jordan, or in fact, any piece of refining equipment that is successful, and being so held, work is done on them when carried across and in close relationship to the stationary bars. Not alone are fibrages formed on the leading edge of the rotating element, but on the leading edges of the stationary bars, this is caused by the high velocity of excess of stock, propelled by the rotor, that is trying to escape.

4. That this fundamental characteristic of fibrage formation has also a selective action, i.e., the longer fibers are more readily caught and retained while the short fibers slip off. Hence in a beater, short fibers are less likely to treatment than long fibers.

There have been other theories advanced of fiber development. One has been the hydraulic theory or shooting the stock

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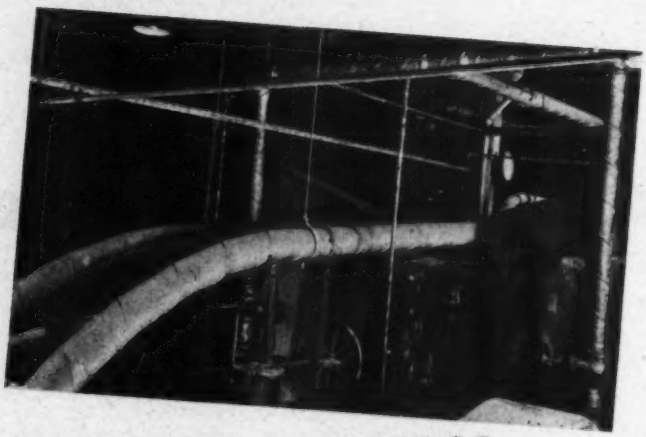

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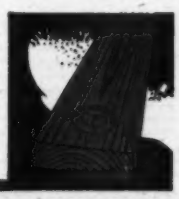

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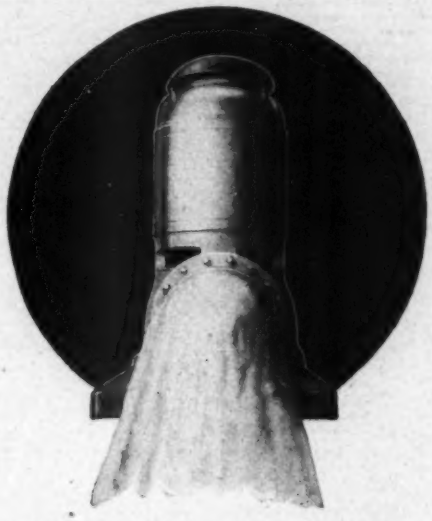

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against a target with high velocity or rotating a mechanical device in the stock at high velocity. A number of these machines have been developed and tried, and to my knowledge all that they ever succeeded in doing was to give the fibers a degree of flexibility and separating them, and this was always done at a very high cost in power. You can actually get this same action in a beater by raising the roll off the plate or in a refiner by moving the rotor away from the stator. All of us know what has happened. We do not have time to wait around for fiber to be developed on this basis.

Then there is still another theory—that of squeezing fibers in a constricted mechanical passage. This might be so called "wedging action." To my knowledge there has been no machine built that actually has proved successful for fiber development that bases its final results on this type of action. This type of action may be used successfully for fiber separation, or for possible reduction of coarse objects such as screenings, but not for fiber development.

I am sure that we will all agree that stock preparation in the sense that we have discussed it, is a mechanical problem and is naturally subject to the improvement in the use of new materials and the knowledge of their application.

Until comparatively recent times, the papermaker arranged with the manufacturer the selection of tackle so that he could accomplish a given set of results, i.e., if it was desired to do only hydrating, wide bars were selected, or if the primary object was to cut, then thin bars were used. Actually what was being accomplished was a crude control of the maximum contact pressure between rotating and stationary elements without realizing that the pressure is important in fixing what can be accomplished in a given machine. With stock at a fixed density in a machine with wide bars, the fibers may be only bruised; but with duplicate conditions and thin bars all the fibers may be cut. The working pressure fixes the separation of working elements, and hence, the type of work that takes place.

When I say pressure, I mean net effective pressure for the actual not instantaneous area of contact. This is quite different than the projected arc of the plate on the roll, or the shell and on the plug, which is frequently a way of figuring for pressure. The instantaneous area of contact has been generally ignored, very likely because it has been difficult to determine. It has been found that by controlling the pressure on this effective area, that very widely different results can be accomplished with the same filling. For example, with a sharp filling, by controlling the pressure so that it is very light, a remarkable job of fiber separation can be accomplished without in any way cutting the fibers. By determining pressures, we are placed in a position immediately to know whether a given set of filling for a machine will prove effective for producing the best results. We find, also, that different types of fibers will stand pressures of different amounts and to make a given kind of paper, we must have at our command certain pressures if we are to accomplish these results with economy. This naturally leads to the application of controls.

(Concluded on page 1370)

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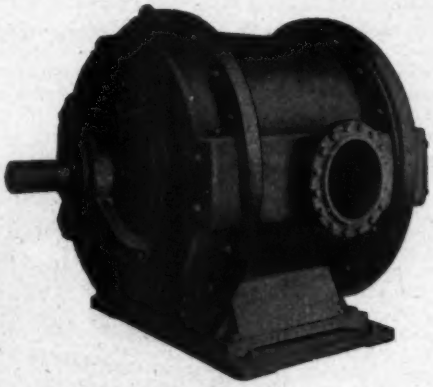

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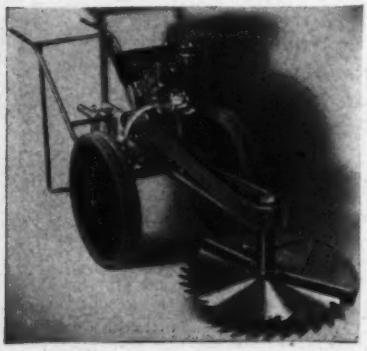
NEW EQUIPMENT AND SUPPLIES

Power Saw for Cutting Pulpwood

Harry A. Lowther Company, 141 West Jackson Boulevard, Chicago 4, Ill., has announced the *Lowther C-Saw* for use in timber felling and for pulpwood bucking operations. The device incorporates a 30-in. circular saw with guard, a 6-hp. air-cooled gasoline engine, a V-belt drive, a welded steel tubular frame with wheelbarrow-like handles, a heat-treated steel axle with roller bearing hub assembly and two 26-in. disc-type wheels into a composite unit.



The saw has extra large teeth and extra deep gullets. Its speed is 1,150 rpm.

The drive arrangement utilizes four 112-in. V-belts which are arranged on constant centered drive pulleys. The saw mandrel, equipped with Timken roller bearings, allows for positioning of the saw throughout the range from vertical to horizontal.

When desired, the wheels can be equipped with dual-pneumatic tires.

According to the manufacturer, this saw has cut through a 24-in. hardwood tree in less than three minutes, and through 11 inches of spruce in seven seconds.

Alkali- and Acid-Resistant Cement

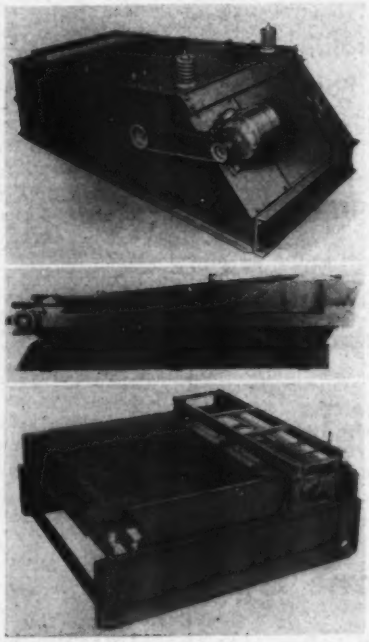
The U. S. Stoneware Company, Akron, Ohio, has announced a synthetic resin cement that is characterized by extreme density, high compressive and tensile strength, and excellent resistance to acids, alkalies, hydrocarbons, and solvents. The cement, designated as *Duracite*, comes in the form of a liquid and powder. These materials can be stored indefinitely before mixing without deterioration. The manufacturer suggests the use of Duracite as a mortar for acidproof masonry in tank linings, floors, sewers and towers, and for other installations handling alternately acids and alkalies, recommending it for temperatures up to 350 Fahr.

Screens for Pulp and Paper Mill Applications

Nordberg Manufacturing Co., Milwaukee 7, Wis., has announced three different types of screens for pulp and paper mill service. These screens individually are designated as Symons Rod Deck Type K. Symons Type F, and Symons Hydro-Sizer.

The Symons Rod Deck Screen, as its name implies, has a screen surface composed of rods instead of woven wire mesh or perforated plate. While originally developed for mining service, it is suggested by the manufacturer as being adaptable for use in pulp mills as chip screens, sliver screens, and knotters.

The Symons Type F Screen utilizes a screen deck of rigid box construction with horizontal screening surface either of cloth or of perforated plate. Suggested applications for this unit, as given by the manufacturer, include chip screening, dewatering, knot removal and removal of undesirable solids from chemical liquors.



Above: Symons Rod deck Type K; (center) Symons Type F; and (below) Symons Hydro-Sizer.

The Symons Hydro-Sizer Screen utilizes a screening action that varies the amplitude of vibration from the feed end to the point of discharge. It also makes use of wire cloth, in some cases 65 mesh and finer, as the screening medium. Applications suggested for this unit by the manufacturer include the recovery of solids in white water (save-alls), and the fine screening of stock.

Dust Collector

Dust Filter Co., 4418 North Clark St., Chicago 40, Ill., has announced the *Dustex* portable dust collector for use in removing obnoxious dusts from industrial operations. Manufactured in sizes ranging in filtered air delivery rates from 240 cfm to 1,000 cfm, the units maintain constant static air suction of more than four inches at a velocity of approximately 5,000 lineal feet per minute.

As the air-borne dust enters the collector, the heavier dust particles are removed centrifugally. Following this separation, the finer particles are impinged upon a filter

surface, the filtered air, in turn, being discharged from the unit.

The filter assembly consists of two corrugated layers of wire mesh covered with 60-mesh, noninflammable, filter cloth. A muffler is used on the discharge to deaden air noise.

The units are fireproof; are 30 to 51 in. high; and weigh from 75 to 200 lb.

New Plastic Packing

A plastic packing, designated as *Palmetto Plastic Packing* No. 1, has been announced by Greene, Tweed & Co., 4377 Bronx Boulevard, New York 66, N. Y. In the making of this packing, two lubricating agents (graphite and flakes of soft antifriction metal) are distributed evenly throughout fibers of asbestos, and the whole thoroughly mixed with a heat-resistant binder. The mixture is then formed into continuous lengths by an extruding operation which gives the packing a square outline.

According to the manufacturer, this shape may be altered, if necessary, to suit special requirements, as compression, rolling or pounding does not impair its usefulness. Likewise, the manufacturer recommends the packing for air, ammonia, gases, water, mild chemicals and general services at temperatures not exceeding 550 Fahr.

The packing is packed in boxes containing approximately 7 lb., each coil being given a protective wrapping of light-thread, wide-mesh braid.

to the Mill Supt.

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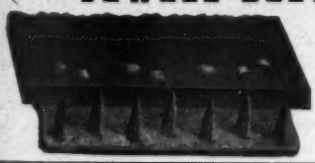

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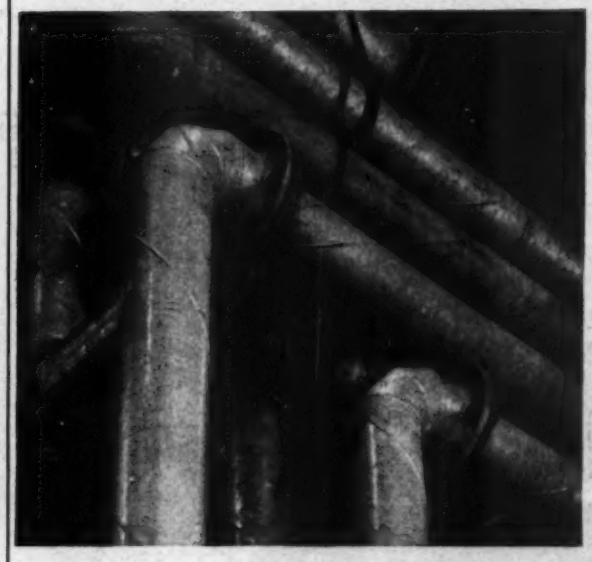

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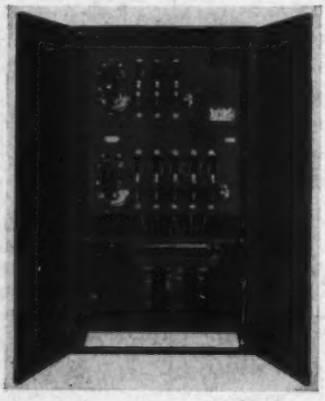
Fan-Cooled Worm Gear Speed Reducer

De Laval Steam Turbine Co., Trenton, N. J., has announced a fan-cooled worm gear speed reducer. In this design, a fan mounted on the worm shaft draws air at high velocity over and around heat dissipating ribs upon the air side of the oil reservoir housing the gearing. The use of a double wall confines the cooling air to the housing, thus securing close air-to-metal contact for transfer of heat.

According to the manufacturer, the design removes the heat so effectively that the capacity of the gear is doubled for practically all ratios and sizes at 1,750 rpm.

Motor Starter

A magnetic, reduced voltage cage motor starter, which protects motors from sustained overloads, locked rotor condition, single-phasing and overloading from too frequent starting, has been announced by



the Allis-Chalmers Manufacturing Company, Milwaukee 1, Wis. Reduced voltage, two-point starting is obtained with an auto-transformer, utilizing accurate, synchronous motor-driven, adjustable timing relay for transition from starting to running position. Units rated through 800 hp. have built-in-auto transformers; above 800 hp.; auto-transformers are furnished for separate mounting. Interrupting capacity rating of the starter is ten times the motors full load current.

The starter is available for control of motors from 5 to 2500 hp., up to 5000 volts, 3-phase, 50 or 60 cycles.

Self-Bonding Floor Material

Continental Asbestos Refining Corporation, 1 Madison Ave., New York, has announced *Stonoleum* as a self-bonding floor material that can be laid over concrete, wood, or composition floors, or can be used for patching. The product, according to the manufacturer, feels like rubber and wears like stone.

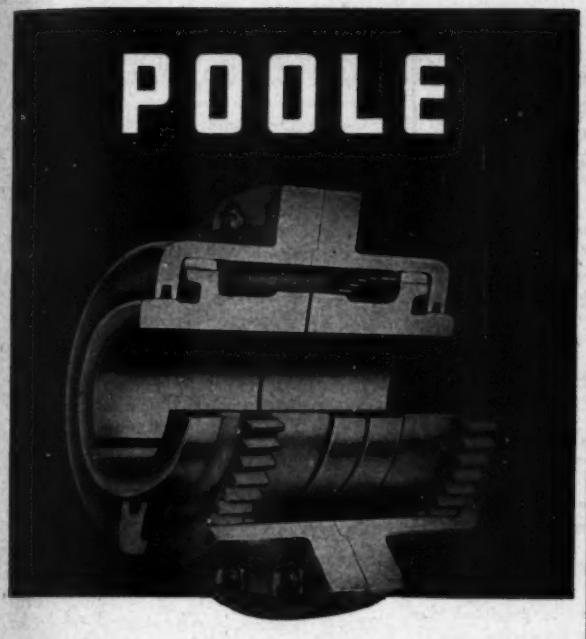
Water Analysis Apparatus

Chief Chemical Corporation, 1123 Broadway, New York 10, N. Y., has announced the *Aero-Titrater* as an instrument for rapid and precise determination of calcium and magnesium hardness in water. Based on a foam-meter principle, the instrument is supplied calibrated and ready for assembly and use. To make a test (which can be done within ten minutes), requires a sample of 50 ml. or less.

According to the manufacturer, the instrument functions so satisfactorily in the presence of interfering substances that it can be used directly with samples which contain chlorides up to 2000 ppm.; that sulphates up to 1000 ppm are without effect; and that large iron concentrations and the treating and conditioning chemicals and compounds used in boiler waters do not interfere.

Acidproof Apron

The B. F. Goodrich Co., Akron, Ohio, has announced a heavy-duty, acidproof apron. The apron is made with a treated fabric combined with a plastic. A ⅞ in. wide tape, arranged in criss-cross shoulder design, is attached to it, with grommets at the top and sides. The edges of the apron are hemmed throughout. Made in one size only, 35 in. by 47 in., the apron weighs 1¾ lb.



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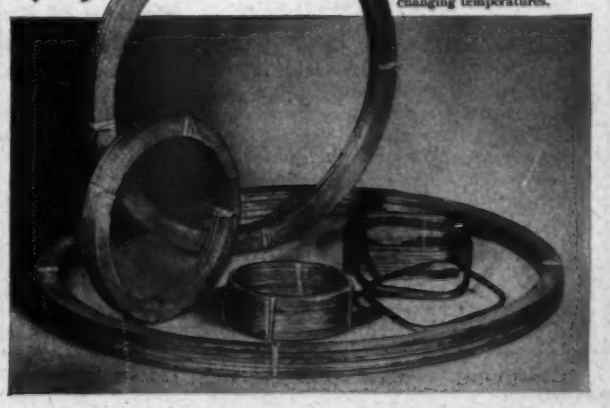

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TECHNICAL DEVELOPMENTS

These abstracts are of the latest developments found in the American and foreign press.

Acetic Acid Pulps

In the presence of certain catalysts, such as perchloric acid, sulphuric acid, zinc chloride, etc, wood may be pulped by the use of acetic acid liquors. The speed of delignification is contingent on the nature and the amount of catalyst. This variation is reflected in the yields obtained within a definite time period, in which the variable is the amount of the catalytic agent. For example, when 1-6% sulphuric acid (based on the weight of wood) was used with the acetic acid, the yields pulp varied from 40-55% at the end of 1 hour. The highest yield was obtained with 3% sulphuric acid. The concentration of catalyst also has a significant effect upon the pulp quality. Lower concentrations give rise to light colored soft, but shivy pulps. As the concentration increases the pulps become harder, darker, more parchmentized and less bulky. At the highest concentration (6%), attack on the wood fiber is evident. Acetic anhydride, when added to the delignifying reagents gave pulps that were lighter, bulkier, and softer. In general the acetic acid pulps resembled kraft. The experiments reported are on wood, but the process, with suitable modifications, should lend itself to straw. When the waste liquors are evaporated, a hard, black, shiny resin results. This can be crushed to a fine plastic powder. W. A. Wiltshire. Proc. Tech. Section, Paper Makers' Association of Gt. Britain and Ireland, 24, 347-53 (1943).

Vinyl Packaging Materials

The use of so-called Geon resins for packaging is rather new. They show exceptional resistance to deterioration in aging. They also show resistance to heat deterioration promoted by heat during processing, and do not suffer rapid breakdown because of sunlight or oxygen.

Furthermore, these resigns are resistant to the following: greases, oils, hydrocarbons, and almost all corrosive chemicals (including acids, alkalies, and oxidizing agents). They manifest good tensile strength and elongation as well as unusual resistance to abrasion. They are not destroyed by fungi. They are nearly tasteless and odorless and non-inflammable. With the exception of the "hot melt" technique, they are adaptable to all common packaging fabrication processes provided they are suitably plasticized. They may be spread on paper by using either a ketone solution or simply in the form of a latex, without organic solvent. It is possible also to incorporate them into paper stock by means of the beater or by application at the press roll. An unsupported film of the resin may be formed by casting from a solution or from latex, and can also be formed into an unsupported film or applied to paper by hot calendering.

Although at present these resins are restricted to war applications, in the future they may find possibilities in high wet-strength papers, in grease resistant wrappers, and even in artificial leather. M. Scott Moulton. Modern Packaging 18, No. 3, 131-2, 166, 168 (1944).

The Magnesium Bisulphite Pulping Operation

An ideal chemical pulping operation is one in which the chemical reagent can be recovered and recycled with but slight loss so that the initial cost of the chemical is no longer a major consideration. In the alkaline processes this ideal is approached. About 90% of the chemicals are recoverable, and the wood is well utilized in that about 50% is recovered as pulp and most of the rest is used as fuel. The sulphite process, in its present form, does not enjoy this same advantage. Chemicals are lost and about half of the wood substance is wasted in the form of the liquor which furthermore presents a serious pollution problem. By replacing calcium bisulphite by magnesium bisulphite many of these drawbacks can be overcome. The cyclic recovery process equipment required is illustrated by a flow diagram.

Another diagram shows the heat and chemical balance calculated for a 100-ton mill. As soon as materials and equipment are available, it is intended to convert the Cornwall and Longview mills to the magnesium sulphite pulping system, a conversion that has been hampered by the War. The process does not preclude the recovery of such by-products as vanillin, alcohol, etc., because there is no need of burning all the organic matter. The recovery of substantially all the waste liquor, its neutralization and evaporation are necessary steps in the recovery of the magnesium, so that the cost of these operations do not have to be charged against the cost of alcohol, etc. Geo. H. Tomlinson. Pulp Paper Mag. Canada 45, No. 11, 817-20 (1944); cf. B. I. P. C. Dec. 1944.

Picking of Paper and Related Problems

The authors discuss the forces involved when, after contact of the inked surface with the paper (in printing), the two surfaces are pulled apart. These are a combination of the ink viscosity and surface tension of the different layers. Depending upon the cohesive forces within a homogeneous layer, or the adhesive forces between different types of layers, the break, on separation of paper and ink plate will occur where the least resistance is offered.

However in the system plate-ink-paper, another effect is introduced in that the paper offers a porous surface, thereby increasing the adhesion between the paper and the ink. Because of its flexibility, paper tends to stick to the printing surface and in a rotary press it is raised in a hump just beyond the nip of the plate. The ink plate then pulls the paper, which is also subjected to the tension of the grippers until eventually the ink film is ruptured.

These two opposing forces cause some shearing of the paper surface and if a certain limit is exceeded, the cohesion of the sheet is overcome and paper tearing or surface damage will occur. In very extreme cases, while the paper and printing plate are being separated the entire sheet tears (a rather rare phenomenon). More common troubles are "picking" or "plucking" or "fluffing". These troubles can be reduced by decreasing the viscosity of the ink by the use of thinners, or by decreasing the speed of the printing machine; but these two remedies have their limits.

If the troubles still persist, the papermaker must make alterations in the sheet. Another effect on pulling apart of the plate and paper is the splitting of laminated sheets into single sheets. For example in duplex paper, the bond between the two sheets is weaker than the adhesion between fibers of the individual sheets. If rupture occurs in the printing press it usually takes place between the sheets at the line of demarcation. This splitting may be differentiated from picking or fluffing because often considerable areas are detached at one time. The picking is due to weak areas in the paper coating. The fluffing is due to loose fibers on the uncoated paper. Usually by regulating machine speed and ink consistency eliminates the difficulties. V. G. W. Harrison and C. C. Mill. Patra J. 8, No. 1, 6-11 (1944) through B.I.P.C. November 1944.

"Diphenyl Wrap"

The Crown-Zellerbach Corporation has developed a fruit-wrap tissue paper which has been treated with diphenyl. Citrus fruits wrapped in ordinary tissue paper are provided with a cushioning material that prevents box burns and abrasion. Drying and shrinkage was also prevented. On the other hand something more was required to protect against losses due to mold infection, and diphenyl supplied this requirement, because it was toxic to molds without injuring the fruit. The mixture of diphenyl, refined paraffin wax and neutral mineral oil cannot be added in the beater. It is added as a fountain at the dry end of the machine, where the dried tissue passes over a kiss roll fed from the fountain. Shipments of grapefruit, oranges, limes and lemons using such treated tissue have been satisfactory. Anon. Chemurgic Digest 2, No. 20, 298-300 (1944); Monsanto Magazine 23, No. 5, 14-16 (1944).

Treatment and Care of Heating Surfaces

The method briefly described depends on cleaning those soiled surfaces that have contacted flue gases with a mixture of ammonia and steam, and in treating the cleaned surface with a graphite emulsion. The process is known as the "Hutter method." von Lassberg. Papier-Fabr. Wochbl. Papierfabr. (1943) 329-30.

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PAPERMAKING PATENTS

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Apparatus for Making Tissue Type Paper

Patent No. 2,340,103. Earl E. Berry, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin. Application December 9, 1940, Serial No. 369,219. 3 Claims. (Cl. 92—49).

1. In a paper making machine having a forming wire trained around a couch roll and a top suction couch roll cooperating with said first mentioned couch roll, the improvements of a drier drum rotatably mounted at a level beneath the level of the couch roll in spaced lateral relation from the couch roll, a suction press roll assembly, a pick-up felt trained through the nip between the couch rolls and a nip between the rolls of the suction press roll assembly for picking up a web of paper from said forming wire to convey the web to the press roll assembly, transfer roll cooperating with the top portion of said drier drum on the side thereof remote from the forming wire, a bottom liquid-pervious felt trained through a nip of said press assembly, around said transfer roll and above the drier drum in the path of heat convection from the drum for covering the web on the pick-up felt, for conveying the web from the press assembly to the drier drum, and for being heated by the drier drum and a suction box acting through said bottom felt at the nip area of said press assembly to transfer the web from the pick-up felt to the bottom felt.

Method and Apparatus for Recovering Chemicals of Sulphate Paper Pulp

Patent No. 2,339,998. Norman A. Lewthwaite, Port Townsend, Wash., assignor to Crown Zellerbach Corporation, San Francisco, Calif., a corporation of Nevada. Application July 19, 1940, Serial No. 346,412. 2 Claims. (Cl. 210—199).

1. In an apparatus of the character described including a pulp digester and a vat into which the discharge from the digester is received, the combination of a rotary vacuum filter rotated in said vat, the interior of said filter being divided into an endless series of consecutive compartments for receiving the liquor abstracted from the sheet of pulp picked up by the filter from the vat, a vacuum chamber arranged to cover the compartments located in a zone of predetermined length through which zone the rising side of the filter travels, whereby the compartments in said zone and said vacuum chamber will receive the liquor abstracted by the filter from the initial section of the sheet, means for separately collecting the liquor received from said vacuum chamber, a second vacuum chamber arranged to cover the compartments located in a second zone of predetermined length through which the filter travels after leaving the first zone during its continued rotation, means for applying a shower of weak liquor to said sheet while the filter travels through said first zone, said shower located a predetermined distance from the boundary between said first and second zones to prevent the weak liquor from said shower from penetrating entirely through said sheet before entry into said second zone, means for applying a second shower of wash water to said sheet in said second zone, a connection between said second vacuum chamber and said means for applying said shower in said first zone whereby the filtrate obtained from said second vacuum chamber will constitute the liquid for said first-mentioned weak-liquor shower, and means for separately collecting any excess filtrate from said second vacuum chamber which is not used for said weak liquor shower and combining said excess with the filtrate obtained from said first zone, whereby a high density of the resulting mixture is obtained.

Apparatus for Determining the Bursting Strength of Sheet Material

Patent No. 2,340,733. James d'A. Clark, Appleton, Wis., assignor to The Institute of Paper Chemistry, a corporation of Wisconsin. Application April 2, 1942, Serial No. 437,354. 2 Claims. (Cl. 265—14).

1. An apparatus for determining the bursting strength of sheet materials, in combination, a rigid platen means for supporting a sheet of the material to be tested, said platen means having a flat upper surface and a recess formed in said surface, an extensible diaphragm, means including a flat disc and an annular clamping ring for supporting said diaphragm within said recess, the relative dimensions of said recess and said diaphragm supporting means being such that said diaphragm is normally disposed substantially coplanar with the flat surface of said platen means, a clamping head movable into and out of engagement with said platen means, means including a piston for moving said clamping head into engagement with said platen means with predetermined pressure so as to hold the material being tested in surface contact with said diaphragm, a recess in the face of said clamping head into which the material being tested and said diaphragm may be forced during test, a source of fluid pressure, means including piping and a control valve having four positions for connecting said source of fluid pressure to said piston and to said diphragm for effecting the operation of said apparatus, said means being operable when said valve is in the first position to cause said clamping head to be held out of engagement with said platen, being operable when said valve is in the second position to move said piston and clamping head into engagement with said platen and said diaphragm support means, being operable when said valve is in the third position to apply pressure to the side of said diaphgram which is opposite said clamping head to accomplish the bursting of the material being tested, and operable when said valve is in the fourth position to disconnect said source of fluid pressure and relieve the pressure previously applied to said piston and diaphragm, and means for indicating the pressure which is applied to said diaphragm during the operation of said apparatus.

Method of Sizing Paper

Patent No. 2,340,728. Chester L. Baker, Penn Wynne, and Charles H. Dedrick, Drexel Hill, Pa., assignors to Philadelphia Quartz Company, Philadelphia, Pa., a corporation of Pennsylvania. No Drawing. Application June 28, 1939, Serial No. 281,736. 6 Claims. (Cl. 92—21).

1. In the sizing of paper, the process which comprises forming a dilute solution of sodium silicate having a weight ratio of SiO_2 to Na_2O within the range of about 2.8:1 to 3.9:1 and a concentration within the range of about 0.5 to 5.0 per cent by weight of SiO_2, reducing the alkalinity of the solution until it is within the range of about 0.05 to 0.2 per cent Na_2O as determined by titration using methyl orange as indicator, aging the resulting solution until the addition of a small quantity of aluminum sulphate causes the precipitation of a hydrous silicate having a weight ratio of SiO_2 to Al_2O_3 not substantially less than 8 to 1, adding the aged solution to a beater furnished with the usual water and paper pulp and also adding sufficient aluminum sulphate to cause the precipitation of substantially the entire SiO_2 content of the beater as hydrous silicate under conditions causing said precipitate to combine with the paper pulp.

◆

. . . Stock Preparation

(Continued from page 1362)

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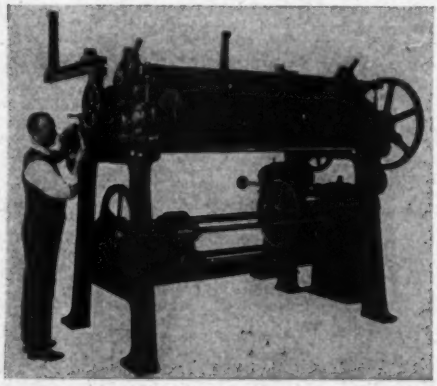

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New Catalogues and Publications

Allis-Chalmers Manufacturing Company, Milwaukee 1, Wis.—Bulletin L6348 may be obtained on request from this company. It describes the new arc welding electrodes in the Allis-Chalmers line, and includes separate charts on physical properties of weld metal for each electrode as well as on recommended current values. These electrodes are both a-c and d-c types and easily identified by official AWS classification numbers.

A. W. Cash Valve Manufacturing Company, Decatur, Ill.—A new 28-page descriptive catalogue is sent in response to inquiries addressed to this company. It features detailed information and specific data on the automatic valves and controls made by this company for use with water, air, steam and oil.

Cleveland Crane & Engineering Company, 1129 E. 283rd Street, Wickliffe, Ohio—In the first number of the third volume of the "Cleveland Crane Graphic" are shown installations of presses, cranes, and tramrail systems made by this company. Of particular interest to the pulp and paper industry are the use of cranes for handling heavy timber, and a tramrail system which handles rolls at a tissue manufacturing plant.

Cochrane Corporation, 17th and Allegheny Ave., Philadelphia 32, Pa.—Reprint 36, "Water Deaeration Halts Corrosion of Equipment" free on application to this company, describes the use and general design of cold water deaerators to prevent corrosion of pipe lines, heat exchange equipment, etc.

The B. F. Goodrich Company, Akron, Ohio—Just published is a six-page folder on the Punch-Lok method of banding and splicing electrical applications. The booklet describes the tools used in the Punch-Lok method, lists sizes of preformed and open end clamps available in Everdur, a copper brass alloy for electrical use, and tells in step-by-step detail how to apply the Punch-Lok bands on electrical jobs such as connecting, splicing, reinforcing, tieing and repairing lines.

The B. F. Goodrich Company, Akron, Ohio—A six-page catalogue section on its recently introduced rechargeable wet storage battery for flashlights is available on request. It outlines the development of this battery as the answer to the expendable dry-cell problems where flashlights are in constant heavy service. The charging units sold in connection with the battery are also described and illustrated, as well as testers and testing methods.

Graton and Knight Company, 356 Franklin Street, Worcester 4, Mass.—Now available from the Merchandising Department of this company at the above address is its "Leather Belting Selection and Application Manual." It is a simple, non-technical approach to the problems involved in power transmission, and an excellent reference book, containing 56 pages of data, charts and specifications under the following headings: how to pick the right leather belt for the job, including information on tonnages, figuring of belt dimensions, etc.; how to decide between group drive and automatic tension (pivoted motor base) drive; how to compare the efficiency and cost of multiple V-belt drives and flat drives; how to figure flat leather belt prices; how to install flat leather belts properly; how to make belts deliver more power and last longer. It also includes a catalogue section of leather belting and accessories.

The International Nickel Company, Inc., 67 Wall Street, New York 5, N. Y.—Available on request to equipment designers, engineers or other metal users, is "Corrosion," a 54-page publication just issued by the above company. It is a convenient and comprehensive analysis of corrosion principles for both the practical man and the technician in the metal field. A good working knowledge of corrosion, it is believed, is the best possible means of securing maximum equipment life and minimum maintenance costs in situations where corrosion must be taken into consideration. The opening section explains how corrosion processes work and discusses the known factors that influence their action. These discussions are illustrated with graphs, drawings and tables. A detailed review of testing methods follows, telling how service conditions are simulated in corrosion research. The last section analyzes the applicability of Monel, nickel and Inconel in various corrosive media. Tables list nearly 500 typical corrosives in which these alloys have been successfully used, and the results of more than 120 tests under varied conditions in 44 common corrosive agents are given.

Lyon-Raymond Corporation, 1957 Madison Street, Greene, N. Y.—Bulletin No. 138 issued by this company illustrates its line of foot-operated and hand-operated hydraulic pumps, shows applications for these pumps, and contains a table of pump specifications.

Multiple V-Belt Drive Association, 140 S. Dearborn Street, Chicago 3, Ill.—A booklet just prepared under the direction of the Engineering Research Committee of this association is available from its headquarters, entitled, "19 Reasons Why It Is the Dominant Drive of Industry." A primer-like presentation of the basic advantages of a Multiple V-Belt Drive, it is illustrated with clever drawings to bring out the points mentioned.

North American Philips Company, Inc., 100 E. 42nd St., New York 17, N. Y.—A new 12-page booklet has been announced by this company, which describes X-ray diffraction techniques and applications. Included are diagrams, typical diffraction films, and tabulations to show how Norelco X-ray is used for identification, research and production. Special pages are devoted to power, back-reflection focusing and low-angle scatter cameras. The method of interpretation of X-ray diffraction films is also explained. The booklet catalogues the problems in various fields that can be handled with X-ray diffraction.

Preformed Wire Rope Information Bureau, 520 North Michigan Avenue, Chicago—Free on request to the Bureau is a 36-page booklet recently issued, listing and explaining a few of the uses to which wire rope has been put in World War II. It graphically portrays those uses in 90 interesting photographs with explanatory captions.

Quigley Company, 527 Fifth Avenue, New York 17, N. Y.—Literature is now available from this company, covering its entire line of industrial finishes, including Triple A Catalog, Color Card and bulletins on Aluminum, Marine, Dairy White and Mill White Protective Coatings.

Roots-Connersville Blower Corporation, Connersville, Ind.—Just issued is a new 4-page general bulletin, No. G-81-D, covering the rotary positive blowers and gas pumps, centrifugal blowers and exhausters, rotary positive vacuum and liquid pumps, rotary displacement gas and liquid meters, and inert gas generators, produced by this company. The folder is well illustrated and includes typical installation views of Roots-Connersville equipment. Copies may be had from the main office or any branch.

The Thompson Electric Company, 1101 Power Avenue, Cleveland 14, Ohio—In a 20-page supplement, No. 44a, to their Catalogue No. 41, specifications are given for the entirely new and recently developed line of 3-way, 4-wire, 4-pole disconnecting lowering hangers. These hangers are designed for use with high-positioned combination twin or triple unit mercury and or incandescent lighting equipment, also where color lighting or various degrees of illumination are required. The catalogue also includes the 2-wire, 2-pole, single circuit hangers, parts lists and new accessory items.

Westinghouse Elevator Co., 150 Pacific Ave., Jersey City 4, N. J.—Copies of a new 16-page illustrated booklet, "How to Plan Your Postwar Air Conditioning Today," may be secured from this company. An explanation of air conditioning; the principal features which must be considered in planning air conditioning for specific applications, and descriptions and illustrations of equipment are included.

C. H. Wheeler Manufacturing Company, Lehigh and Sedgley Avenues, Philadelphia 32, Pa.—Just completed for this company are Folders 944, Tubejet Vacuum Pumps, and 1144, Dual Bank Steam Condensers. Both booklets are well illustrated, showing different types of pumps and condensers.

Books

A Study of Paper Mill Waste Disposal at Kalamazoo Valley Paper Mills—A publication of the Michigan Engineering Experiment Station, Michigan State College, East Lansing, Michigan, this publication, designated as Bulletin No. 99, is the work of E. F. Eldridge of the Engineering Experiment Station staff. It is a 72-page paper-covered bulletin that reveals the objectives and techniques employed in making of a survey of the Kalamazoo River and its tributaries between Comstock and the Allegan Road bridge below Otsego, and the results of the survey. The major purposes of the survey were to determine the conditions of the river between these points, to show the quantity of suspended matter deposited in the river bed, and to show the reduction in the oxygen demand of the pollution entering the river. Recommendations for the handling of the waste disposal problem of the mills concerned with the study also are made. The publication is priced at 50 cents a copy.

The Fiske Plan for Free Enterprise and Post-War Employment—This book has been written by Lieutenant Edward R. Fiske, U.S.N.R. and dedicated as follows: "To my fellow countrymen whom, in peace, I hope to see prosperous, united and tolerant, free from the malice of all bigotry, so that this nation may go forward with all men reaching greater heights spiritually, socially and economically."

According to George J. Seedman, national president, American Business Congress, who wrote the foreword, "The Fiske Plan deserves the serious attention of independent manufacturers, wholesalers and retailers, for it offers them the opportunity of a favorable place in the sun alongside their larger competitors." Published by The Christopher Publishing House, 1140 Columbus Ave., Boston 20, Mass. The book is priced at $2.25 a copy.

Aids to Technical Writing—This publication is the work of Richard C. Jordan and Marion J. Edwards, both of the University of Minnesota Engineering Experiment Station. It has been written for persons interested primarily in engineering rather than in writing. The subject content covers: Planning for the Printer, Style in Non-Letterpress Publications, Preparation of Manuscripts for Magazines, Bibliography Forms, Footnotes, Numbers, Equations, Tables, Proofreader's Marks, Photography in Technical Publications, Abbreviations for Scientific and Engineering Terms, Conversion Factors, Letter Symbols, Preparation of Drawings for Publications, Graphical Symbols and Proparation of Charts and Tables for Lantern Slides. The book contains 60 illustrations and 12 tables. It is paper-covered, pocket size; and is priced at fifty cents a copy. The publisher is the University of Minnesota Engineering Experiment Station, Minneapolis, Minnesota.

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NEW RAGS

OPA ceiling prices in sales to consuming mills delivered buyer's usual receiving point, with brokers' allowance not in excess of 5 per cent.

	per cwt.
Blue Overalls	-5.50
Corduroy, Men's	-3.50
Corduroy, Ladies'	-3.00
Washables, No. 1	-3.00
Percales	-4.75
New Soft Blacks	-3.75
Light Prints, No. 1	-4.50
Khaki Cuttings—	
Bleachable	-4.25
Unbleachable	-3.50
New White Canvas	-6.50
New Mixed Blacks	-3.25
Canton Flannels, Bleached	-7.00
Shirt Cuttings—	
New White No. 1	-7.25
No. 1 White Headings	-7.25
White Shrunk	-5.00
Silesias No. 1	-5.75
New Unbleached	-7.50
Fancy	-3.50
Linen Cuttings—	
American	-5.00
White	-14.00
Grey	-14.00

RAGS (Domestic)

f. o. b. New York City

OLD RAGS

OPA ceiling prices in sales to consuming mills f. o. b. cars at points of shipment, with brokers' allowances of $1 to $2 a ton depending on the value of the grade involved.

	per ton
Roofing—	
No. 1	31.00
No. 2	29.00
No. 3 and No. 4	27.00
Twos and Blues—	
Repacked	44.00
Thirds and Blues—	
Repacked	44.00
Miscellaneous	36.00
Whites, No. 1—	
Repacked	76.00
Miscellaneous	64.00
Whites, No. 2—	
Repacked	58.00
Miscellaneous	53.00

RAGS (Foreign)

ex dock New York City

NEW RAGS — per cwt. — Nominal

New Dark Cuttings
New Mixed Cuttings
New Light Silesias
Light Flannelettes
Unbleached Cuttings
New White Cuttings
New Light Oxfords
New Light Prints

RAGS (Foreign)

ex dock New York City

OLD RAGS — per cwt. — Nominal

No. 1 White Linens
No. 2 White Linens
No. 3 White Linens
No. 4 White Linens
No. 1 White Cottons
No. 2 White Cottons
No. 3 White Cottons
No. 4 White Cottons
Extra Light Prints
Ord. Light Prints
Med. Light Prints
Dutch Blue Cottons
French Blue Cottons
French Blue Linens
Checks and Blues
Linsey Garments
Dark Cottons
Old Shopperies

ROPE and BAGGING

f. o. b. and ex dock New York City

	per cwt.
Gunny No. 1—	
Foreign	Nominal
Domestic	2.75 to 3.00
Wool Tares—	per cwt.
Light	3.00 to 3.25
Heavy	3.25 to 3.50
No. 1 Scrap Bagging	2.60 to 2.85
Manila Rope—	
No. 1 large	-*115.00
No. 1 small	-*105.00
Sisal Rope—	
No. 1 large	-*95.00
No. 1 small	-*80.00
New Burlap Cuttings	5.50 to 6.00
Jute Threads—	
Foreign (Nom.)	6.25 to 6.50
Domestic	5.50 to 5.75
Strings—	
No. 1 sisal	-*80.00
No. 2 sisal	-*60.00
Soft jute	5.00 to 5.50
Mixed	1.75 to 2.00

*OPA ceiling price per ton f. o. b. shipping point.

WASTE PAPER

OPA ceiling prices f. o. b. points of shipment for machine compressed bales weighing not less than 500 pounds (with differential of $5 per ton less on certain grades for loose or bundled stock), and brokers' allowance of 4 to 9 per cent.

Shavings—	per ton
White Env. Cuts, One-Cut	67.50-
Hard White Env. Cuts	62.50-
Hard White, No. 1	57.50-
Soft White, No. 1	50.00-
Soft White, One-Cut	57.50-
Soft White, Misc.	43.00-
Fly Leaf, No. 1	33.50-
Fly Leaf, Woody, No. 1	25.00-
No. 2 Mixed Col. Woody	18.00-
Flat Stock—	
No. 1 Heavy Books and Magazines	38.50-
Mixed Books	22.00-
Ledger Stock—	
No. 1 White	46.00-
No. 1 Mixed (Colored)	40.00-
Manilas—	
New Env. Cuttings	53.00-
New Env. Cuts, One-Cut	37.50-
Extra Manilas	39.00-
Manila Tab Cards, Free of Ground Wood	45.00-
Ground Wood Manila Tab Cards	27.00-
Kraft—	
Envelope Cuttings	65.00-
Mixed Env. or Bag Cuts	55.00-
Tripled Sorted No. 1 Brown	50.00-
New 100% Cor. Cuts	45.00-
No. 1 Old Assorted	35.00-
News—	
White Blank	33.00-
Oversissue	22.00-
No. 1 Baled	20.00-
Old Corrugated Containers	28.00-
New Corrugated Cuts	18.00-
Mill Wrappers	22.00-
Box Board Chips	14.50-
No. 1 Mixed Paper	10.00-

CHEMICALS

f. o. b. shipping point

Alum (Papermakers)—	
Lump, cwt.	4.25-
Ground, cwt.	4.00-
Powdered, cwt.	4.40-
Blanc Fixe—	
Pulp, bulk, ton	40.00 to 46.50
Dry, barrels, pound	60.00 to -
Bleaching Powder—	
Drums, cwt.	2.25 to 3.10
Casein (Domestic Standard)—	
20-30 mesh (bags), lb.	22.00 to 24.00
80-100 mesh (bags), lb.	—
Argentine, lb.	17.50 to 18.50
China Clay—	
Domestic Filler	
Bulk (mine) ton	7.50 to 15.00
Domestic Coating	
Bulk (mine) ton	11.00 to 32.00
Imported (ship side)	
Bulk (lump) ton	14.00 to 26.00
Chlorine—	
Tank cars (wks) cwt.	2.00 to 2.25
Gelatine (silicin), lb.	.90 to .95
Glyc. (C.P.) drums, lb.	18.25 to 18.75
Litharge, powd., bbl., lb.	.09 to -
Rosin (Gum)—	
New York, per 100 lbs.	
E	6.55-
F	6.65-
G	6.60-
WW	7.45-
Rosin (Wood), carlots	4.50-
Salt Cake—	
Dom. bulk (wks) ton	15.00 to 16.00
Imp. bulks on dock— (Atl. ports) ton (Nom.)	20.00 to
Soda Ash—	
Bulk (works), cwt.	.90 to .95
Paper Bags, cwt.	1.05 to 1.35
Barrels, cwt.	1.05 to 1.35
Soda (Caustic)—	
Solid, drums, cwt.	2.30 -
Ground and flake, drums, cwt.	2.70 -
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.65 to 2.05
40 deg., 35 gal. drums, (works) cwt.	.80 to 1.45
Starch—	
Pearl, 140 lb. bags, cwt.	3.72-
Pearl, barrels, cwt.	3.83-
Paper (Sp.) bags, cwt.	3.83-
barrels, cwt.	3.92-
Sulphur (crude)—	
(mine) bulk, long ton	16.00 to ——
Talc—	
Dom. 100 lb. bags (mine) ton	16.00 to 21.00
Imp. bulk, ton (Nom.)	—
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05½ to .06
Calcium Pig., bbls., lb.	.06 to .06½
Zinc Sulphide, bbls., lb.	5.60 to 5.85

WOOD PULP

OPA maximum prices applicable to wood pulp delivered to consumer mills located East of the Continental Divide exclusive of Denver, Colo. (West of the Continental Divide and in Denver, Colo., ceilings are $6 per ton lower):

Bleached softwood sulphite	86.00
Unbleached softwood sulphite	74.00
Bleached hardwood sulphite	83.50
Unbleached hardwood sulphite	71.50
Northern bleached sulphate	86.00
Southern bleached sulphate	79.00
Northern semi-bleached sulphate	82.00
Southern semi-bleached sulphate	75.00
Northern unbleached sulphate	73.00
Southern unbleached sulphate	63.50
Bleached soda	72.00
Unbleached soda	68.00
Groung wood pulp	50.00
Ground wood—paper machine dried and mutilated	53.00
Sulphite screenings	43.50
Sulphate screenings	38.00
Ground wood screenings	32.00
Northern unbleached sulphate siderums	73.00
Southern unbleached sulphate siderums	63.50
Standard news print siderums	50.00

PAPER

f. o. b. New York City

Boards—	per ton
Binders	84.00-
Chip	48.00-
Chip, tube and can	50.00-
Chip, full-bending	52.50-
Chip, sgl. mla. lined	60.00-
Coated, white patent .016	80.00-
.020 and heavier	75.00-
Kraft liner	63.00-
News	48.00-

Book Papers—OPA base maximum prices per cwt. 4 cases or equivalent, f. o b. mill with quantity, weight, manufacturing and other differentials allowed:

Uncoated (Untrimmed)

Book, White (M. F.)—	
A Grade E. F.	8.25
B Grade E. F.	7.80
C Grade E. F.	7.35
D Grade E. F.	7.30
E Grade E. F.	7.05
No. 2 Uncoated Offset 4 sides. White	8.45

Coated White (Trimmed 4 sides)

No. 1 Glossy	11.90
No. 2 Glossy	10.85
No. 3 Glossy	10.15
No. 4 Glossy	9.80
No. 5 Glossy	9.30
C2S Offset	10.40
C1S Litho (Varnish)	10.05
C1S Litho (Non-Varnish)	9.80

Writing Papers—OPA base maximum prices per cwt. on writing papers, f. o. b. mill with zone, quantity, packing and other differentials allowed:

Rag Content Bond—	per cwt. 20 lb.	16 lb.
Extra 100% Rag	34.00	34.00
100% Rag	28.00	28.00
75% Rag	20.00	20.00
50% Rag	16.00	17.25
25% Rag	14.00	15.00

Rag Content Ledger—	per cwt. Zone 1
Extra 100% Rag	35.00
100% Rag	29.00
85% Rag	26.00
75% Rag	21.00
50% Rag	17.00
25% Rag	15.00

Sulphite Bond—	per cwt. 20 lb.	16 lb.
Air dry, watermarked	12.75	13.70
No. 1 (M. F.) watermarked	9.00	9.70
No. 2 (M. F.) watermarked	8.25	8.85
Plain (M. F.) unwatermarked	7.60	8.20

Sulphite Ledger—	per cwt. Zone 1
No. 1 (M. F.) watermarked	10.00
No. 2 (M. F.) watermarked	9.25
Plain (M. F.) unwatermarked	8.60

Glassine (f. o. b. mill)—	per cwt.
Embossed (25 lb. up)	13.75 to 14.25
Bleached (25 lb. up)	12.75 to 13.25
Unbleach. (25 lb. up)	11.50 to 12.00
Greaseproof—	
Bleach. (25 lb. up)	11.00 to 11.50
Unbleach. (25 lb. up)	10.00 to 10.50

News—OPA Ceilings	per ton
Rolls, Standard (Contract)	58.00
Rolls, Lightweight (Cont.)	62.00
Rolls (Spot)	(nominal)
Sheets	66.00

Tissues (Carlots)—	per ream
White, No. 1	1.12½ to 1.20
White, No. 2	.90 to 1.00
Bleached Anti-Tarnish	1.15 to 1.20
Colored	—
Anti-Tarnish Kraft	.70-
Manila	.90 to .95
Napkins, semi-crepe (12½ lb. to M shts.) per cs.	.60-
Napkins, full crepe and emb'sed (12½ lb. to M shts.) per cs.	.60-
Toilet, Bleached (M shts.) per cs.	5.65-
Toilet, Unbleached (M shts.) per cs.	4.25-

Towels—	per case
Bleached	3.20 to 3.75
Unbleached	2.60 to 3.05

Wrappings (Kraft)—	per cwt.
Super-Standard	5.25 to 7.65
No. 1 Wrapping	5.00 to 7.40
Standard Wrapping	4.75 to 7.15
Standard Bag	4.37½-

Wrappings (Sulphite and Bleached Kraft)— (Rolls, f. o. b. mill)

Bleached papers— M.F. & M.G. Waxing,	per cwt.
20 lb. (Carloads only)	7.25 to 7.80
(10,000 lbs.)	7.50 to 7.75
Drug wrapp. 35 lb.	7.00 to 7.35
Unbleached Papers—	
Com. Grd. Butch. 40 lb.	5.50 to 5.75
No. 1 Butchers	5.75 to 6.00
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.25 to 6.50
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.00 to 6.25
Steam Finish, 50 lb.	5.00 to 5.25
Water Finish, 40 lb.	5.50 to 5.75

Manilas—	
Envp. Mla., Sub. 16-40 (No. 1)	6.00 to 6.50
Envp. Mla., Sub. 18-28 (No. 2)	5.75 to 6.00
Envp. Mla. (Prices based on large sheets untrim'd reamarked, in bdls.)	
Wrapp. Mla. 35 lb. up—	
No. 1	6.00 to 6.25
No. 2	5.75 to 6.00
M. G. Sulphite and Kraft (other than Waxing)	
Grade A-22 lb.	7.20 to 7.40
Grade B-30 lb.	6.75 to 7.00

four of the many plate patterns cast for use with Bauer pulpers.

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Bauer pulpers are "tailor made" for the work to be done. For instance, mills pulping mixed papers for boxboard or container, or mills salvaging rejects and screenings, are supplied entirely different plate patterns.

Therefore, regardless of the grades you run, *thru plate selection*, Bauer pulpers can, in almost every case, be equipped to do your particular job.

As you look about for ways to improve your preparation equipment, be sure to consider installing Bauer pulpers.

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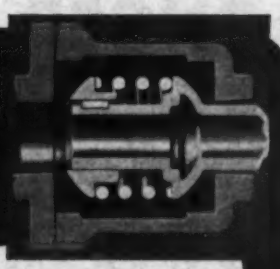

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Its packless, self-oiling, self-adjusting, self-aligning design has released for other work countless man-hours otherwise needed for maintenance. It has saved much valuable production time otherwise lost when machines are shut down to repack stuffing boxes or repair the ravages of misalignment. The way it lends itself to modern methods of syphon roll drainage has helped to step up operating efficiency in hundreds of mills.

Today these time-saving, production-boosting features of the Johnson Joint are of first consideration. At the same time remember that the Johnson Joint can pay its own way out of savings. That will give you an idea of the peacetime possibilities of Johnson Joints, and of the mill that is equipped with them.

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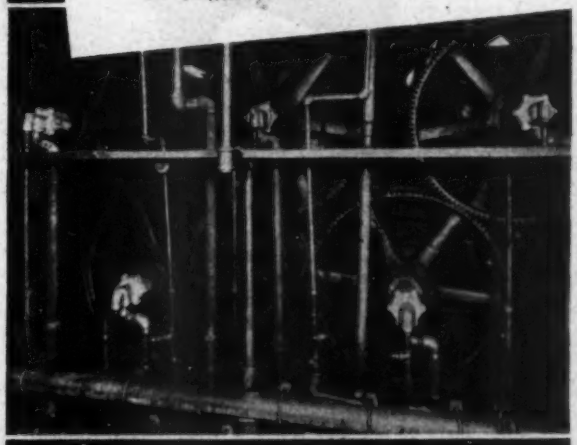

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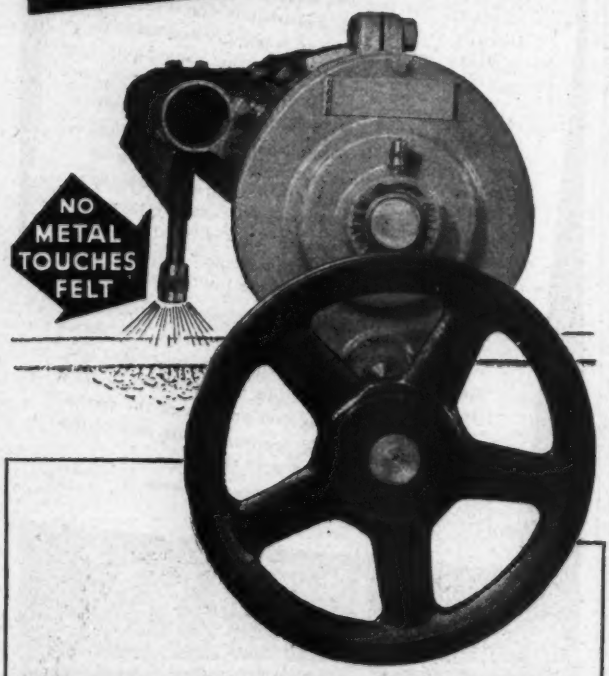

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Operation of the Conditioner is continuous, without in any way interfering with machine operation. In fact, because the Scofield Felt Conditioner reduces shut downs and felt changes, machine operation and production are actually stepped up.

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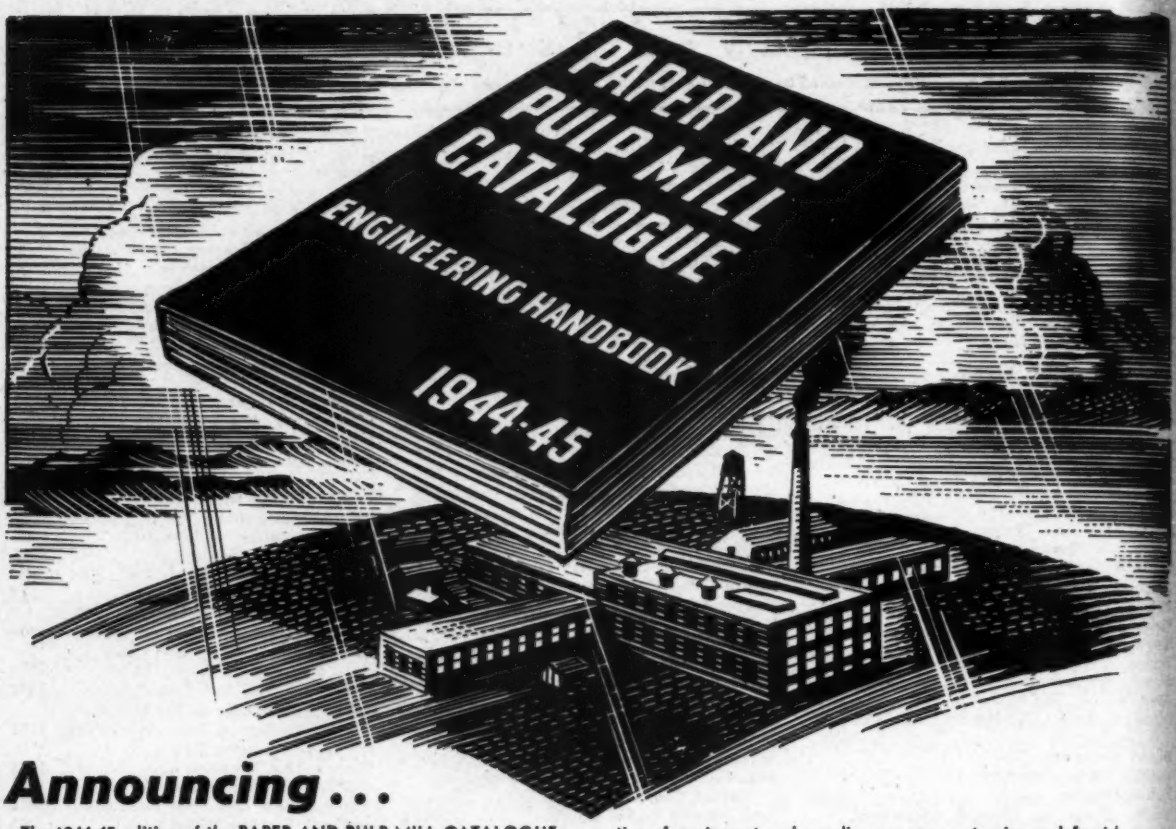

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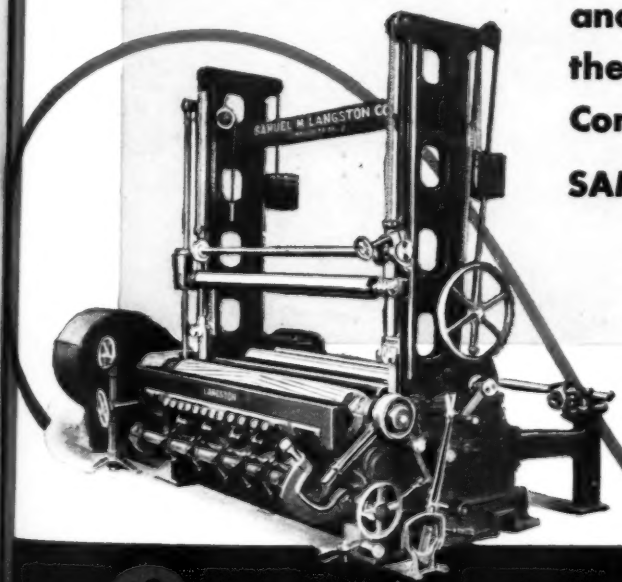

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